Ontario

REPORT OF THE AGRICULTURAL RESEARCH INSTITUTE OF ONTARIO

APRIL 1, 1985 - MARCH 31, 1986

Ministry of Agriculture and Food

87-01405/

COVER PHOTO: Black Angus cattle: one of the main breeds of beef cattle grown here and one which originated in Scotland.

Cover photo by David Barr.

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REPORT OF THE AGRICULTURAL RESEARCH INSTITUTE OF ONTARIO

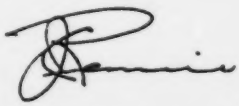
Toronto, Ontario
March 31, 1986.

Dr. D.H. Lees, Chairman
Agricultural Research Institute of Ontario

Dear Sir:

I submit herewith a report of the Ontario Ministry of Agriculture and Food's research programmes in agriculture, veterinary medicine, and consumer studies for the year ending March 31, 1986.

Respectfully submitted,



J.C. Rennie
Director of Research
Agricultural Research Institute
of Ontario

Scarborough, Ontario
April 1, 1986

The Honourable Jack Riddell
Minister of Agriculture and Food
Legislative Buildings
Toronto, Ontario M7A 1A3

Dear Sir:

I have the honour to submit the twenty-fourth research *Report of the Agricultural Research Institute of Ontario* for the period April 1, 1985 to March 31, 1986.

The Institute wishes to express its sincere appreciation for the wholehearted cooperation of the administration and staff of the institutions at Centralia, Guelph, Kemptville, New Liskeard, Ridgetown, Toronto, and Vineland in the planning and execution of research programmes in agriculture, veterinary medicine, and consumer studies.

Respectfully submitted,

D.H. Lees
Chairman
Agricultural Research Institute
of Ontario

INTRODUCTION

The Agricultural Research Institute of Ontario Act passed by the Provincial legislature created the Institute in 1962 with the specific duties and responsibilities over the expenditure of the Ontario Ministry of Agriculture and Food's research funds for agriculture, veterinary medicine, and consumer studies. The ARIO meets every two months to review research programmes, to inquire into whether or not they meet the needs of the industry, and to make recommendations to the Minister, where appropriate, on the expansion or reduction of programmes and their human and physical resources.

The ARIO is composed largely of farmers and agribusiness people and its membership reflects the broadly based nature of Ontario's agricultural industry. The membership, of not more than fifteen, is appointed by the Lieutenant Governor in Council who also appoints the Director of Research from the Ministry.

Eight centres report to the ARIO: Agricultural Laboratory Services, Centralia College of Agricultural Technology, Economics and Policy Coordination Branch, Horticultural Research Institute of Ontario, Kemptville College of Agricultural Technology, New Liskeard College of Agricultural Technology, Ridgetown College of Agricultural Technology, and University of Guelph. The six experimental stations, Arkell, Cambridge, Elora, Guelph, Ponsonby, and Woodstock, are managed by the University under contract with the Ministry.

Under the Act, the Institute may accept donations and grants of monies for research which are held in trust by the Director of Research and allocated for research in accordance with the terms of the funds. These funds are usually from commercial sources and are used for specific projects.

The ARIO is a unique corporate body responsible to the Minister of Agriculture.

MEMBERS OF THE AGRICULTURAL RESEARCH INSTITUTE OF ONTARIO

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Mr. H. Vander Pol, Vice-Chairman
Dr. J.C. Rennie, Director of Research
Miss M. Toivonen, Comptroller
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Mrs. G. Helin
Mr. C. Hunter
Dr. R. McLaughlin
Mr. K. Murray
Mr. B. Schubert
Mr. R. Steckle
Dr. P. Wall

REPORTING INSTITUTIONS

Agricultural Laboratory Services **ALS**
Building 43, McGilvray Street
University of Guelph
Guelph, Ontario
N1G 2W1

Centralia College of
Agricultural Technology **CCAT**
Huron Park, Ontario
N0M 1Y0

Economics and Policy
Coordination Branch **EPC**
Ontario Ministry of Agriculture and Food
and Food, 4th Floor
801 Bay Street,
Toronto, Ontario M7A 2B2

Horticultural Research Institute of Ontario **HRIO**
Vineland Station, Ontario
L0R 2E0

Kemptville College of Agricultural Technology **KCAT**
Kemptville, Ontario
K0G 1J0

New Liskeard College of Agricultural Technology **NLCAT**
New Liskeard, Ontario
P0J 1P0

Ridgetown College of Agricultural Technology **RCAT**
Ridgetown, Ontario
N0P 2C0

University of Guelph **UG**
Guelph, Ontario
N1G 2W1

BUDGET

1985-86 RESEARCH FUNDING	Ontario Government Funding	Trust Fund (Receipts)
Agricultural Laboratory Services Branch	$ 35,000	$ —
Economics & Policy Co-ordination Branch	1,400,000	—
Ontario Crop Introduction & Expansion Program	147,000	—
University of Guelph	19,073,000	188,626
Education & Research Division	3,488,000	—
HRIO	4,019,000	183,778
ACAFT	118,000	—
CCAT	180,000	29,393
KCAT	1,140,000	70,730
NLCAT	601,000	118,080
RCAT	1,854,000	225,110
Red Meat Research	—	1,750,000
Marketing Division	290,000	—
TOTAL	$32,345,000	$2,565,717

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Research Highlights

This section outlines only a few of the projects and important results arising from research funded through the Agricultural Research Institute of Ontario. A complete listing, by institution, is given in the section, Inventory of Agricultural Research Projects.

ANIMAL PRODUCTION

Research on swine is looking at a broad range of topics dealing with management for more economic and efficient production: reproductive behaviour, reduction in death of new-born piglets, optimum temperatures for growing pigs, more efficient diets, and social behaviour as it affects performance are a few of the areas under investigation.

Swine

Studies at **RCAT** indicate that **the Tibor variety of naked oats is an excellent feedstuff for growing and finishing pigs.**

Four groups of 32 pigs each were raised from 32 kg to 97 kg live weight on one of four diets containing 0%, 30%, 65%, and 96.75% naked oats. Although feed consumption dropped, growth performance was maintained and feed efficiency improved significantly as the level of naked oats in the diet increased. Carcass merit characteristics were very satisfactory with the naked oats. An economic analysis revealed that Tibor oats were worth about $200 per tonne as a feedstuff for growing pigs.

Results of **feeding naked oats to very young pigs** of 8 to 18 kg during a second trial involving 60 weaners were less encouraging. Here, three diets were fed, the control, one containing 96.75% naked oats, and one also containing a high level of naked oats plus soybean meal supplements to make the diet isonitrogenous, that is, equal in crude protein content to the control (18%). The reduction in feed consumption for both the diets with high levels of oats significantly depressed growth performance (P .05) and feed conversion (P .05). More work is needed to determine economic dietary levels of naked oats for starter pigs.

Chelated minerals are ones that have bonded to other molecules such as amino acids. These minerals can be utilized effectively by livestock since they have a different absorption site and mechanism in the small intestine than do minerals in the ionic form. Chelated minerals are being promoted in Ontario as a means of improving production efficiency in swine. At **RCAT**, 68 sows were divided into two groups. One group was fed the control RCAT nursery sow diet whereas the remaining sows were fed a nursing sow diet supplemented with a commercial chelated mineral package and 5% beet pulp.

The results involving 102 litters revealed no differences between the diets for pigs born per litter, rate of stillbirths, nursing piglet survival, pigs weaned per sow, average piglet weaning weight, or the weaning-to-breeding interval. Chelated minerals, therefore, appear to be of no value for improving production efficiency.

Work on **spray cooling of feeder pigs** at **RCAT** was reported in the mid 1970's. Several reports have also been made on the benefits of evaporative cooling. Many of these cooling systems are in use today in Ontario with reports of success. An experiment was conducted at RCAT involving 576 pigs over three summers. The results indicated the following:

1. Evaporative cooling kept temperatures down by as much as 5-6° C on hot days; however, the price for this was higher humidity.
2. Spray-cooled pigs appeared to keep slightly cleaner pens.
3. The overall growth performance of pigs on both cooling treatments was not significantly different from the control groups. The results are slightly different from early trials with spray cooling where it was determined that the cooled pigs utilized feed much more efficiently. This variance in results may have been caused by several factors present now such as improved barn ventilation, lighter market weights of the experimental pigs, and a different feed ration and feeding management.

Norwegian kelp meal has been fed to livestock for many years. It is rated for its ability to provide some of the essential vitamins and minerals animals require and is being sold as a means to correct or improve the diet of pigs. **RCAT** examined the efficacy of a Norwegian kelp meal product, Algit, in the diets of 128 weaner and grower/finisher pigs. An economic analysis of the data indicated that Algit might have a value as high as $250 per tonne for weaner pigs and of $450 per tonne for finishing pigs when fed at low levels of 2% for weaners to 4% of the diet for grower/finisher pigs under current market conditions. This is far below the present price of the product making the addition of kelp to finishing pigs' diets uneconomical in most cases.

Pre-weaning piglet mortality accounts for 20% to 30% of pigs born regardless of breed type, management level, or climatic conditions. This high figure represents a major financial loss to the Ontario swine industry as regards production output, feed costs, and labour involved.

Data from 3525 piglet death certificates were collected on 885 litters from the **RCAT** swine herd. These litters represent the mating of 276 Yorkshire × Landrace sows to 63 Yorkshire × Hampshire boars over an 11-year period. On the basis of visual or post-mortem examinations of the carcasses, the causes of death were identified and categorized. The main cause was stillbirths which made up 37% of total pre-weaning mortality. This was followed by trauma at 26% and hypoglycemia/starvation at 22%. The remaining causes included scours, suffocation, bacterial and viral infections, congenital defects, and unknown factors.

Identifying specific causes and the incidences of pre-weaning piglet mortality may help decrease losses. This ultimately would improve production efficiency by increasing the number of pigs weaned per sow farrowing.

Research at **UG** has shown that **the type of floor used**, that is, bare concrete, bedded concrete, slotted, or raised-perforated, affects the **temperature at which young pigs feel comfortable**. Young pigs were housed on these various floors with access to a microswitch by which they could turn on a heat source if they so desired. The piglets perceived an environmental temperature of 20°C on bedded concrete as being about equivalent to 17°C on bare concrete, 14°C on perforated metal, and 17°C on raised, rubber-covered floors. Producers should

be aware of these differences so that piglets can be housed above their lower critical temperature, that is, the effective temperature at which they must produce more heat to maintain body temperature.

Studies at **UG** indicate that **feeding excess energy to sows during gestation may decrease feed intake during lactation and increase the interval from weaning to estrus.** Feeding 2.5 kg per day of a diet during the first gestation resulted in an average intake of 2.7 kg during lactation; feeding 1.5 kg during gestation resulted in an intake of 3.8 kg per day during lactation.

Sows in their first gestation fed 1.5 kg per day returned to estrus sooner after weaning than those fed 2.5 kg per day during gestation. The number of pigs weaned per litter was similar in each case.

Producers frequently are concerned about low feed intake during lactation and about their sows' weight loss and slow return to estrus. Excessive feeding during gestation is a possible reason. A more conservative feeding level at this time may mean lower total feed requirements per sow with equal or improved reproductive efficiency.

A genetic evaluation programme for swine was developed at **UG** and put in place across the country. The programme provides estimates of the genetic merit of performance tested pigs for backfat and growth rate and of measures of genetic changes in the breeding population, and permits predictions of future changes in the short term. Because national testing programmes are costly, genetic change in tested herds needs to be monitored to evaluate the direction and effectiveness of current breeding programs.

All breeds are making genetic progress for growth rate and increased rates of genetic improvement are projected for the near future. Recently, there has been less emphasis in selection placed on backfat measurements. According to projected genetic changes, reduction of backfat should continue in the white breeds such as Yorkshire, Landrace, and Lacombe, but at a lesser rate than before. There is, at present, no genetic improvement being made in backfat in the coloured breeds such as Duroc and Hampshire. Because of the antagonistic genetic relationship between backfat and growth rate, there likely will be increased fatness, genetically, in the coloured breeds in the future as selection intensifies for growth rate. This would have undersirable economic consequences since swine producers are paid for slaughter pigs on the basis of leanness. Swine breeders should reassess their breeding goals accordingly.

OAC Wintri triticale developed at UG is used as a fall-sown cereal. Evaluation of it or pigs at UG indicates that it has a slightly lower energy value than corn, but may contain higher levels of protein. When triticale supplies all of the grain portion of the diet, however, feed intake may be somewhat reduced.

In General, OAC Wintri triticale may replace corn on an equal weight basis in growing-finishing swine diets up to a level of about 50% of the corn without affecting performance appreciably. At higher levels of replacement, there may be reductions in feed intake and rate of gain. In formulating swine diets, this triticale should be assumed to contain about the same level of protein as corn even though some samples actually have higher levels.

Research at **UG** has shown that **mycotoxins on corn influence the performance of pigs**. Levels of zearalenone as low as 1 ppm may cause enlargement of the vulva in gilts six to ten weeks of age. Higher levels, for example, up to 9 ppm, may cause a more rapid and dramatic response without affecting rate and efficiency of gain. Levels greater than about 3 ppm may cause an increase in the number of gilts not exhibiting estrus.

Vomitoxin at levels greater than 1 ppm in the diet will decrease feed intake and rate of gain in growing pigs. At levels of about 10 ppm vomitoxin, feed intake may be reduced by approximately 50%.

This research delineates the potentially severe effect of these mycotoxins on swine productivity. Other research has identified some potential factors in diet that may reduce these detrimental effects; however, the efficacy of the dietary factors in practical swine production needs further evaluation.

Increasing the stocking density of pigs in pens is one way to improve the efficiency of pork production. Results of two years of trials at **UG** with pigs housed at 0.35 m^3 for 20-50 kg pigs and 0.70 m^3 for each 50-90 kg pig show no reduction in feed/gain ration or rate of gain. This work was conducted both on fully slotted floors and on solid floors with deep, narrow gutters. Pig performance was 0.92 kg/pig/day gain and 2.6 kg feed/kg gain. The average weight at market was 90 kg and 140 days old.

Recent work at **UG** has demonstrated that **cold stress in baby pigs contributes to the development of neo-natal diarrhea**. The mechanism for this diarrhea appears to be the switch from a propulsive motion of the intestines, which tends to clean out infectious bacteria, to a 'to and fro' motion which promotes maximal absorption of carbohydrates, but allows bacterial floral to increase rapidly. These results were constant even in piglets which had been vacinated, but which were challenged with a number of strains of bacteria. This work demonstrates the importance of management and housing in avoiding infectious disease.

Work at **UG** has shown that **'family life' is important in swine reproduction**. Seasonal infertility is an insidious and major cause of losses to the swine industry throughout the world. This may take the form of sows which do not return to estrus after farrowing or have low reproductive efficiency after mating. Trials were carried out in which the boar was kept in the same room as the sow after mating or was removed. Results indicated a much higher farrowing rate in those sows kept in the presence of the boar. The effect is believed to be due to pheromones or reproductive odours from the male which affects post-mating fertility in the female.

Beef

Recommended protein levels for feeder cattle have been based in the past on animal weight and expected rate of gain. The type of feeder cattle available to Ontario feedlot operators has changed dramatically over the past 15 years, however, with the advent of imported European beef cattle. Over the past two years at **RCAT**, various levels of protein ranging from 16% to 10% have been evaluated for feeder cattle to assess the most economic one to feed.

Steers started on a 14% diet consisting of 62% ammoniated corn silage, 28% cracked corn, 5% soybean meal, and 5% supplement containing minerals and rumensin, and then finished on a 12% diet of 63% silage, 30% cracked corn, 2% soybean meal, and 5% supplement returned $75 per head after all expenses except labour were deducted. The comparable figures for the 16%-16% and 12%-10% diets were $64 per head.

It is of interest to note that, although higher protein diets cost significantly more to feed, there is a corresponding increase in daily gain, feed efficiency, and carcass weight up to at least 14%-14% diets, and in some cases, as in 1983-84, the 16% diet. The result was that the net returns were not lowered as much as expected. The highest returns were from diets of 12%-12%, 14%-12%, and 14%-14%, all of which gave similar returns.

A variety of breeds and cross-bred beef cattle are grown now, and researchers have been investigating the relative efficiency of performance of small, medium, and large framed cattle.

A **feedlot study** was carried out at **RCAT** in 1984-85 **comparing small, medium, and large framed steers**. Feedlots that operate at full capacity realize maximum net returns only when the net returns per head per day are maximized. Feeder cattle have changed dramatically in recent years, and it is a matter of controversy as to whether small (Hereford or Angus), medium (Hereford × Simmental), or large (Simmental or Charolais) framed steers are most likely to give the highest net returns.

Small framed steers were ready for market after 182 days in the feedlot whereas the medium and large framed animals did not reach market conditions until 224 days on feed. As expected, large framed steers gained faster, 1.39 kg per day, but had a lower feed-to-gain ratio of 5.91. Small framed steers gained 1.23 kg per day at a feed-to-grain ration of 5.62. They also reached a desirable level of uniformity in fat, had smaller carcasses, and were generally marketable with less waste.

In spite of these results, after all costs were considered, there was a net return per head per day of $.121 for the small framed, $.302 for the medium framed, and $.271 for the large framed steers. These calculations are based on initial purchase price, feed costs, length of time in the feedlot, interest, and miscellaneous costs. A feedlot which could handle 300 head at a time, therefore, would generate an income of $13 250 for small framed steers, $33 069 for medium framed ones, and $29 675 for large framed animals. These figures are based on 1984-85 feed costs and a reasonable market price of $1.42 per lb of carcass or $.82 per cwt live weight.

The Animal Science section of **NLCAT** has co-operated with the **Agriculture Canada Experimental Farm at Kapuskasing** in research on **finishing beef using haycrop silage**. The 'Heap-Silo Method' of silage storage developed at Kapuskasing was used as the preservation system.

Trials from 1981 to 1983 indicated an average daily gain of diet of 25% silage/75% barley. The carcasses from both diets graded A1, but cattle on the 100% silage diet took significantly longer to finish. Cost of production figures are being compiled. It would appear that finishing beef cattle on silage in Northern Ontario is feasible, but the marketing of these animals out of the North continues to pose a problem.

A study at **KCAT** on **double implant treatments for finishing steers** found that there was no improvement in the performance over steers which received normally recommended implant levels. Ralgro implants at 72 mg and 36 mg dosages were compared. No side effects were evident from the higher dosage.

To improve the synthesis of microbial protein in the rumen and the availability of essential amino acids in the post-ruminal area, carbon skeletons of missing amino acids were added in the form of valeric and iso-valeric acid to the diet of young ruminating calves in a recent study at **KCAT**. Simultaneously, an attempt was made to estimate the availability of amino acids in the post-ruminal area and to supply the missing, limiting amino acids in the form of by-pass protein.

As a result of the supplementation, the calves on ground-ear corn and liquid protein diet increased their weight gain by 40%, intake of dry matter by 31%, and feed conversion by 14%. Significantly lowered blood urea levels indicated that the by-pass protein served as a source of limiting amino acids and as such improved the utilization of dietary protein.

This research will improve the profitability of heavy calf production and will be applied on selected farms. In the near future, this concept should be expanded to the nutrition of high producing cows where improved feed intake and protein metobolism are desirable.

During the recent energy crisis, interest increased in producing methane from animal wastes. Of added interest is the fact that the residue from methane fermentation (MFR) is high in crude protein and mineral content. Research at **UG** indicated, however, that while **MFR from cattle manure** has a crude protein content of 25% in dry matter, it **has no value as a protein supplement for feedlot cattle** because of the poor availability of the nutrients. Feedlot operators must realize the MFR cannot contribute anything towards the economic viability of systems for producing methane from cattle wastes.

Swine MFR would appear to have some potential as a cattle feed source because of its higher crude protein content of 38% and improved nutrient digestibilities; however, it too produced poor weight gains. Mineral imbalances are under investigation as a possible part of the problem.

Data from the Arkell Bull Test Station and from a research trial at the Elora Beef Cattle Research Centre of **UG** were used to correlate **gross feed efficiency (gain/intake) with average daily gain as part of evaluation on bulls**. Pooled within breed and season, phenotypic correlations were only 0.27 for the Arkell and 0.56 for the Elora data. This indicates that selecting bulls on the basis of average daily gain is not an effective means of also improving feed conversion efficiency.

A long-term project at OVC, **UG** on **pasturellosis in cattle** is now bearing fruitful results. Studies in the past have defined the types of pasteurella which caused pneumonia in Ontario cattle, and more recent work has determined the specific organisms producing toxins capable of causing the typical injury to the bovine lung.

An experimental vaccine was made based on these cytotoxins and field studies carried out on several hundred feedlot cattle in the past two years. It appears that these toxins provide not only dectectible levels of antibody, but unlike previous products, also give field protection. Industry has been approached on this matter by the University, and a number of firms have shown interest in developing the vaccine for commercial use.

Clinical Studies researchers at **UG** have completed a study on **the efficacy of various antibiotics in the treatment of bovine pneumonia**. With the removal of chloramphenicol from

the market, a study was undertaken to determine the most effective of other antibiotics available. Over 1200 animals were involved with about 40% of them developing clinical disease which were treated with one of three test antibiotics.

The study concluded that penicillin, oxytetracyline, and trimethoprim-sulphdoxine were of equal efficacy. More importantly, it was found that the worth of treatment was more dependent on early therapy and maintenance of a therapeutically effective blood level of antibiotic than on the particular antibiotic chosen. Thus it appears that the most economical antibiotic may be as effective as more expensive drugs if given early and often enough to cattle with respiratory disease.

Poor survival rates for embryos are a serious limiting factor for embryo transfer in beef cattle. Investigators at **UG** have determined that *ureaplasma diversum* **is a common contaminant of the bovine reproductive tract and that this organism is able to adhere to the outer membrane of embryos**. It appears that as much as 10% of embryo transfer fluids is contaminated by the organism and approximately the same percent of abortions can be attributed to infections from it. Work is continuing to determine the prevalence and significance of this organism in bovine reproduction, particularly as it relates to embryo transfer and to ways of combating the effects of the agent.

Dairy

Two common insects that take their toll on growth and production in dairy cattle are the horn fly and face fly; these pests can be controlled successfully by ear tags impregnated with insecticides, but these have to be replaced at intervals. In 1984, an evaluation was made at **RCAT** of **neck chains as an alternative attachment site for the fly tags**.

Tagged heifers had virtually 100% protection from horn flies, and face flies were reduced very significantly. The heifers gained more weight and height while on pasture than without the protection. The neck chain system can thus be a viable alternative to the repetitive use of the ear for fly tags.

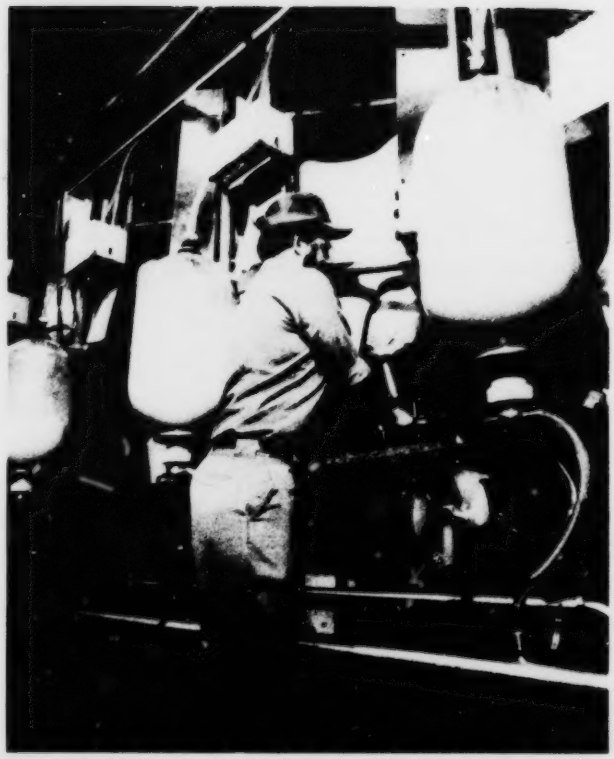
A new feeding supplement manufactured by Ralston Purina Inc. was tested at **KCAT** for 12- to 22-month-old replacement heifers. The **Easy Care Block** is a 22% protein, weatherproof, and self-fed lick block designed to supplement pasture or forage feeding. Two roughages, one of poor, the other of good quality, were fed with half of the heifers in each roughage group offered a lick-block supplement. Their intake from the block ranged from 0 to 2.7 kg/day and was influenced by time and daily temperature, but was similar for both types of roughage.

Performance improved for both groups which had the block supplement over those on roughage alone. Weight increased, although wither height was similar for all groups.

Lick-block supplement costs are 50% to 100% higher than a comparable grain supplement, but are popular with dairy farmers because of convenience and labour savings. This is particularly true when the animals are on pasture. A lick-block pasture experiment with 212 heifers was conducted this past summer on the Leeds County Community Pasture with half the animals on pasture alone and the others on pasture with block supplement.

Artificial insemination dramatically increased the intensity of selection among sires. Such a high intensity of selection changes the nature of the genetic variability in the affected populations. It is, therefore, of critical importance that sires used in AI be evaluated genetically as accurately as possible.

A research project at **UG** which was completed in 1985 has demonstrated, both theoretically and through computer simulation, that existing sire evaluation techniques are unbiased by selection if all genetic relationships are accounted for and if the genetic variation prior to selection is estimated reliably.



Milk production in dairy cattle has been found to be affected by the cow's condition: if she is overly fat at the end of one lactation, she may be susceptible to health problems; if she is in good condition, her milk production will increase in the next lactation.

The present techniques used for estimating genetic variation, however, are biased by selection and underestimate the genetic variance before selection. A new statistical methodology has been developed to circumvent this problem and to estimate genetic variation in an unbiased manner. The use of this new method will result in more accurate genetic evealuation of dairy sires.

Farmers have often overlooked the matter of **appropriate feeding of cows in late lactation and during the dry period**. Researchers likewise have not given adequate attention to the matter in the past. Research data obtained in a study at **UG** has demonstrated that cows which end lactation in good body condition will increase milk production during the early part of the subsequent lactation. On the other hand, cows which end the previous lactation in a very fat condition are more susceptible to health problems.

These research results underline the value of visual appraisal of cows' condition by farmers, extension and industry personnel, and veterinarians. With this information, feeding programmes can be tailored more accurately to achieve the condition that will optimize milk yield and minimize health problems in the following lactation. In the first parity animals, that is, cows which are in their first lactation, the relationship of condition to production and health my be of less significance than in older dairy cows.

A research project at **UG** on ovarian function in dairy cows during early lactation has demonstrated that administration of gonadotrphin-releasing hormone (GnRH) at either 4 or 12 hour intervals between days 5 and 10 post-partum results in more rapid return of the cow to ovulation. In a separate study, it was found that the pre-ovulatory surge of luteinizing hormone, and hence ovulation, occurred earlier in superovulated cows than in control animals with single ovulation. Changes in body

temperature or electrical resistance of vaginal mucus were not useful in predicting estrus or ovulation in either superovulated or control animals.

The results obtained are of significance to the embryo transfer industry in determining the optimum time for insemination of donor cows to provide the maximum number of fertilized oocytes.

Work at UG has shown that, of five software systems evaluated, **the Farm Animal Health Record Management System (FAHRMS) allowed the fastest data entry while the Homestead Dairy System (HCSDS) produced the most accurate reports**. The study was designed to determine the requirements for stand-alone computer systems intended to assist in decision making about health care on dairy farms and the operational, economic, and technical requirements for an effective system. All systems were tested on similar hardware with a benchmark created by analysis of the hypothetical biological events for a 30-cow dairy herd over two years. Researchers feel that computerized assistance for decision making can increase profitability in the dairy industry and that this work should be extended to a field study.

Subsequently a follow-up study **evaluated the Homestead software under field conditions** to assertain how useful it was for dairy farmers and their veterinarians, the feasibility of on-farm versus bureau implementation of these systems, and the economic, technical, and personal acceptability of them to both groups.

The study demonstrated that the DHMS software is equally useful to farmers and veterinarians and that the on-farm approach is more costly, because of equipment needed, than is the bureau approach. On the other hand, on-farm participants utilize the information in these programmes to a greater extent than those using bureau-operated systems. It appears that most veterinarians and the majority of farmers are prepared to invest money in a system such as DHMS and that their expectations for its usefulness are high. Further work needs to be carried out to determine the real cost-benefit factors for on-farm operation of these systems.

A **new, rapid test for detecting infection with bovine leukemia virus** has been developed at UG. It is based on detecting antibodies against the virus, but can be carried out on milk and does not require drawing a blood sample. The test can be completed in a little over an hour. Thus it is appropriate for 'bedside' testing and could be a routine procedure in sales yards as part of health checks before animals are sold. A number of firms have expressed interest in developing the concept for commercial purposes.

Sheep

High technology is being applied to sheep production; work in theriogenology at UG has adapted techniques from cattle studies to accomplish **super-ovulation and embryo transfer procedures in sheep**. These studies are being combined with the use of the rectal ultra-sound probe for early detection of pregnancy as early as 25 days after breeding. Workers feel that this research will allow valuable genetic material to be expanded in sheep flocks as it has in the cattle industry. In addition it will provide model studies for embryo splitting and other manipulations applicable to cattle.

Poultry

Sudden death syndrome in broiler chickens is the most frequent cause of death and growers report that the incidence of it is increasing. High growth rate and body weight have been found to be related to this disease.

Researchers at UG studied serum biochemical parameters plus rate of gain and organ weights in normal broiler cchickens and in those victims of sudden death syndrome. No significant differences were found between male and female broilers or in organ weights of those birds killed for examination and those dying spontaneously of this disease. Body weight and growth rate, however, are directly and significantly related to the incidence of the disease. Since most growers are reluctant to slow growth rates in order to reduce mortality from it, future research should combine genetic selection and nutritional studies to maintain productivity and reduce the incidence of the disease.

Fish

A careful balance of minerals is required for optimal growth of fish under commercial aquaculture. Studies carried out at UG demonstrated that **excess calcium was able to bind up zinc which was otherwise present in adequate levels with the result that cataracts formed in the fish**. This work appears to clarify the cause of a problem which occurred in the past year and affected some three million cultured fish on the west coast of Canada and the United States.

Further studies on appropriate dietary levels for copper, iron, and zinc demonstrated the complexity of determining appropriate levels of these compounds in fortified diets for fish. There is a clear need for continuous monitoring of mineral levels in fish diets in relation to other nutrients to achieve optimal growth and avoid disease.

Laboratory Animals

Sialodacryoadenitis is an inflammation of the glands producing tears and is commonly seen in laboratory rats. The disease is induced from a virus and causes blindness which may invalidate a study in which the animal is used. In experimental studies at UG, young rats and mice developed severe encephalitis following intranasal inoculation with this agent. Further work demonstrated that this virus is able to cause severe tracheitis, bronchiolitis, and pneumonia.

In the acute stage, the disease is not confined to the lacrimal and salivary glands, but may spread systemically involving major organ systems. Prevention of this infection in rats will enhance the value of many studies carried out with this animal as a model species.

On June 23, 1986, Princess Anne turned sod for the Guelph Centre for Equine Research.

CAPITAL EXPANSION

The **addition of about 10 ha** (24 acres) to the **HES, Simcoe** will give station managers and researchers the chance to apply appropriate plot rotation and thus allow a sound experimental plan to operate. The new property is ideal as an addition as it is adjacent to the original property and is of similar soil type. It will enrich the research and development programme at Simcoe considerably.

Eighty one ha (200 acres) of land have been purchased from the City of Woodstock along with some additional land from the Ministry of Community and Social Services as **extensions of the present Woodstock Research Station**. These sections of land, both adjacent to the Station, will provide an ideal base for first-class field crop research. The experimental plot crops will now be able to be rotated and the new land will provide extra feed for sale or for the livestock at the University of Guelph.

The Ministry has purchased an active fish farm as a first step in developing an **aquaculture research** station. Growth in research activity should have a positive effect on the future of the aquaculture industry in the Province.

ECONOMICS

In 1982, the Financial Analysis section of the **EPC Branch** carried out a study to determine average cash rents paid across Ontario and the conditions and arrangements under which cash and sharecrop rental agreements were made. A study conducted in 1984 provided an **update of the information on average cash rents paid**.

The 1984 Ontario Farm Rental Survey was incorporated into the Statistics Canada National Farm Survey. All counties and regional municipalities of Southern Ontario were represented except the districts of Parry Sound, Haliburton, and Muskoka. In Northern Ontario, only Timiskaming and Manitoulin were represented. Of 2393 replies received, 909 were used for summary and analysis.

The total cash rent paid for cropland on the survey was $6.8 million at an average cost of $99 per hectare. In 1982, the average was $121 per hectare. Cash rents were highest in Southwestern Ontario at $188 per hectare and lowest in Northern Ontario at $12 per hectare.

The pattern for rents varied from county to county within each area. The highest average cash rents were paid in Kent County at $247 per hectare, Essex at $208 per hectare, and Oxford at $190 per hectare. Each of these counties has soil and climate favourable for specialty vegetable and fruit crops and tobacco.

Land rental rates were lower in Central and Eastern Ontario averaging from a low of $17 per hectare in Hastings and Frontenac counties to a high of $54 per hectare in Prescott. Crops such as hay, forages, and small grains predominate in these regions.

Cash rental for specialty crop land, as for fruit, tobacco, potatoes, and nursery stock, averaged $179 per hectare. For other crops, average rentals were: soybeans, $172; corn, $131; small grains, $71; general forages, $39; and hay, $42.

Each year, the Financial analysis section of the **EPC Branch** develops **cost of production estimates for all the major crops in Ontario**. Three reports were prepared entitled **Fruit Crops, Grain and Forage Crops**, and **Vegetable Crops**. In all, estimates were prepared for 17 fruit enterprises, 8 grain and forage crops, and 20 vegetable crops.

The information used in these estimates was gathered from recent Branch studies and from consultation with producers and extension, research, and agribusiness people. For each estimate, the data were organized into variable and fixed costs and totalled to arrive at the cost of production per acre and per hectare. Cash costs and gross margins were also calculated.

The **EPC Branch** conducted a survey of over 600 custom farmwork operators during the past year. The information from this is useful in guiding custom operators and farmers who supply and use custom services. With declining grain prices, many Ontario farmers are in a severe cost-price squeeze. By using these services, they can obtain the benefits of specialized machinery such as combines and forage harvesters while keeping down their machinery investments.

Custom farmwork rates vary considerably across the province because of local field conditions, soil type, size and shape of fields, residues on the fields, and a variety of other conditions. The cost of moldboard plowing ranged from $36.28 per ha in Southern Ontario to $33.14 in Western Ontario, $34.84 in Central Ontario, and $39.00 in Eastern Ontario.

Stabilization programme analyses carried out at **UG** have shown that tripartite and other such programmes for red meats have no material effect on trade with the United States. The results of this research provided very important evidence in the industry's battle against countervailing action taken by the United States against Canadian exports of hogs and pork. It is considered to have been an important factor in the level of duty imposed and in the decision to leave pork imports duty free.

Studies at **UG** indicate that **butter advertising in its present form is relatively ineffective**. Since advertising is expensive, producers' returns could be increased from present levels by the reduction of expenditures on advertising.

ENGINEERING

Infrared absorbing (IR) films have been introduced recently to the North American greenhouse market and there have been concerns as to how well they conserve energy and transmit light. A trial was begun at **HRIO**, Vineland in the fall of 1984 to **evaluate various films** for these qualities. One double-bay, 5.5 m wide greenhouse was covered with two IR absorbing films while a second bay greenhouse was clad in two ordinary three-year, UV-stabilized films. All greenhouses are oriented east-west.

Light transmissivity of each of the films is measured in the greenhouse by means of four LiCor PAR (photosynthetic active radiation) sensors per test material and four outside sensors. The transmissivity of the two standard three-year films did not differ from each other and were at least 5% higher than any of the IR films when these were new. Cloud Nine has a significantly higher transmission coefficient than Infrasol 266. Possible energy savings have not been confirmed as yet.

Methane is a desirable by-product of animal waste treatment. The cost of facilities, however, cannot be justified on the energy value of methane alone. Since **the plant also acts to reduce pollution strength of animal manure**, some of the cost must be set against this as well. Methane production trials at **UG** have been in operation since 1977 and are complete this year.

The research involved construction of facilities for various kinds of reactors and running these under a broad range of temperature and loading conditions. Reactors were of traditional design, that is, plug flow and intermittent mix, and a new design, fixed film. Temperatures tested ranged from 18°C to 30°C and hydraulic retention times from 5 to 30 days.

A further by-product of biogas production is single cell protein obtained from the growth of organisms on manure solids. Feeding this by-product to animals might be a low cost source of protein, but results have not been very encouraging when hog performance has been examined. Further economic analysis remains to be done.

Since 1981, **KCAT** has evaluated **the cost effectiveness of the maple syrup Economizer**. This is a machine which captures waste steam which normally escapes from the evaporator. The atmospheric pressure above the sap is lowered by removing the air and the sap is then heated with the waste steam. With these two steps, the temperature of the sap in the Economizer has been raised from 4°C to 50°C. Because of the partial vacuum created above the sap, the sugar content may be increased from 2.6% to 3.2%.

The studies conducted at the College have shown that the Economizer can reduce oil consumption of a standard maple sap evaporator by 27% and increase sap evaporation rate by 42%. On a 1000-tap operation, there can be fuel savings of $632 and labour cost savings of $291 or a total of $923 or $0.92 per tap.

The Maple Syrup Economizer, which consists of eight trays, captures the waste steam and utilizes its heat to preheat maple sap.

FIELD CROPS

Grain

Late seeding can decrease yields because of reduced tillering and fewer heads and panicles per hectare. Co-operative research over two years (1984-85) by **Agriculture Canada** at Kapuskasing, Ottawa, and Thunder Bay, **University of Guelph, W.G. Thompson & Sons Ltd., King Agro Inc.**, and **RCAT** has shown that **yields increased as seeding rates of all the recommended spring barley and oat varieties were increased** by one-third. This was particularly the case when seeding was late.

Increasing the seeding rate of spring barley from 275 to 400 plants per m² (about 110 to 160 kg/ha) increased yields by 0.5% at normal seeding date, 2.9% when seeding was two weeks late, and 0.4% when seeding was four weeks late. Increasing the seeding rate of oats from 225 to 330 plants per m², (about 75 to 110 kg/ha) increased yields by 3.5% at normal seeding date, 3.8% when seeding was two weeks late, and 5.4% when seeding was four weeks late.

The benefits from using the higher seeding rates will be greatest in areas where seeding must be delayed because of inclement weather.

Lodging of cereals is a major, if not the most serious, cause of loss of yield and quality in grain around the world. At best, it costs three times as much in Canada to harvest a 'down' grain crop as it does a standing crop.

After **RCAT** presented data on the **effectiveness of the anti-lodging chemical ethephon** in the 1984 ARIO Report, this chemical was registered, in early 1985. Further research at **NLCAT** and at **RCAT** in 1984 on spring barley and winter wheat which showed 30% lodging for untreated and 0% for Cerone-treated wheat led to the inclusion of a new chapter in the 1986 Ontario **Field Crop Recommendation** publication entitled "Lodging Control".

Although the hectareage on which Cerone is used at present is the privileged information of the product's manufacturer, the use of the chemical will likely increase extensively. Seed growers who rely on high yields of top quality seed will find it particularly useful.

Further work on these growth regulators has been carried out to refine their use. Two years of test in 1984 and 1985 with soft white winter wheat and one year, 1985, with spring barley at **RCAT** has shown that a **tank mix of growth regulators Cerone and Cycocel Extra** was more effective in controlling lodging than either one alone. The mix, called Terpal C in Europe, has the added advantage over Cerone that the timing of application is less restrictive, a definite plus when inclement weather is predicted.

Effectiveness of Cerone in keeping cereals standing (right) compared to untreated plots (left).

After optimum Terpal C rates are defined for the various cereal varieties, this new combination growth regulator will likely become the leading anti-lodging material used by Ontario farmers.

The high cost of corn production and the need to purchase expensive soybean oil meal as a protein supplement makes a corn/soybean combination a relatively expensive feed for pigs. Research at **RCAT** has shown that Tibor hull-less oats can be produced very economically and used as an excellent complete feed.

In the field, Tibor gave groat yields equal to Elgin, a well-known, recommended covered oat variety, and had 10% less lodging, 4% more protein, and 1.5% more oil. Under intensive management, Tibor had protein levels as high as 21.8%. In the barn, market pigs fed the hull-less oats plus Mineral-Vitamin Premix gained 0.84 kg per day as compared to 0.82 kg for those fed a standard, 16.8% protein diet of corn-soybean meal plus Premix. On a per pig basis, Tibor also gave 13% better feed efficiency, a 2.1 kg increase in carcass weight, and a 1% better dressing percentage. Besides many other advantages over corn such as summer instead of late fall harvests, production of excellent straw for bedding, and soil saving and improving capabilities, Tibor's cost of production as a feed per pig was calculated to be less than of the corn-soybean meal.

Research data and the great demand for seed lead researchers to believe that a considerable hectareage now in corn will be sown to Tibor oats in the future.

The Maximum Yield Research Project at RCAT had a new record grain corn yield in 1985 of 18.4 tonnes/ha at 15.5% moisture. This was considerably higher, by 2.3 tonnes/ha, than the previous maximum established in 1984. The maximum silage yield for 1985 was 97.7 tonnes/ha at 65% moisture.

The main factors contributing to the record corn yields of 1985 were hybrid and plant population. A new hybrid was used, Pioneer 3540, which outyielded Pioneer 3707, the former highest yielding hybrid, by 1.3 tonnes/ha. The 'very high' plant population of 103-140 plants/ha outyielded the 'high' plant population of 63 160 plants/ha by 2.5 tonnes/ha. Another factor contributing to the higher yields in 1985 was the greater number of heat units received during the growing season.

RCAT began a project in 1985 **to study the best time to apply nitrogen topdressing on winter wheat**. Various rates of nitrogen, 40, 80, 120, and 160 kg/ha, were applied at three times, mid March, mid April, and mid May, and a split application was made with half of the nitrogen applied at the early date and half at the late date.

Optimum yields were produced with 80 kg of top-dressed nitrogen/ha at all dates. The March and April applications gave 1.1-1.2 tonnes/ha higher yields than did the May ones. There was no yield advantage in splitting the nitrogen top-dressing between the early and late dates.

This research will continue for several more years.

In the spring of 1985, **RCAT**, initiated the **Interseeding in Corn Research Project** in co-operation with the Ontario Soil and Crop Improvement Association and with the financial assistance of Agriculture Canada's New Crop Development Fund and other private organizations.

The project was an expansion of the pilot research on interseeding which began at RCAT in 1981. The expansion had a number of aspects: establishing trials on more diverse soil types from light sands to heavy clays; using an increased number of interseed varieties; comparing a number of row widths and populations in corn; examining the effects of different herbicides on weed control; and studying the effects of rates and times of interseeding.

Six of the eight interseeded varieties grown on the plots provided excellent winter cover. One of the remaining two plots was ploughed in the fall. Analysis is underway to determine the amount of organic matter that will be returned to the soil and the amount of biological nitrogen available to this year's crop. Final analysis of data showed that interseeding had no effect on yield.

NLCAT recently set up the **CropCheck North testing facility in Rainy River**. This means that in future over one thousand farmers in northwestern Ontario will have access to crop production recommendations based on research data gathered from that region.

Several years of research at **NLCAT** on the **intensive cereal management system** have resulted in a clearly defined 'recipe' for Northern Ontario cereal growers. The split system of nitrogen application has been shown to give no significant advantage over a single application and, because of lower disease pressure in this region, fungicides were found to be unnecessary. Finally, the use of a plant growth regulator was found to be of benefit only in years when there was a lot of rain.

Recommendations on intensive cereal management have been made available to northern farmers through numerous district meetings. Producers grow over 20 thousand hecatares of barley in Northern Ontario. With keen interest from growers in producing spring wheat, the agronomy section of the College will be focusing its efforts on developing similar recommendations for that cereal.

At **KCAT, different rates of nitrogen were applied to barley and oats** to determine whether OMAF-recommended rates were still appropriate under Eastern Ontario conditions.

Although research has demonstrated that recommended nitrogen rates should be increased for areas with 2600 heat units or less in Ontario, results from this study over three years showed that the traditional rate of 45 kg/ha for barley and 35 kg/ha for oats is optimal in this area. Moreover, different barley and oat varieties tested responded in a similar manner when nitrogen was added incrementally.

Research at **KCAT** for the past five years has shown that a number of **early-maturing corn hybrids respond similarly to nitrogen**. This research shows as well how these hybrids have improved over the last 20 years with new hybrids outyielding old ones by 50% using high levels of nitrogen.

Separating corn kernels from stover is desirable to provide a high energy feed for certain livestock with high quality stover available for other animals. Trials at **UG** were continued this year with a **full-size prototype to accomplish this separation in whole-plant ensilage**.

Results show that 26% to 32% of the total dry matter of the ensilage was separable grain compared to 50% just before harvest. There were some problems with purity of the final product because of the presence of some broken corn-cob pieces.

Harvesting both kernels and stover in a once-over operation saves energy and increases the amount of stover recovered. Separating the ensiled whole-plant corn at feeding time into high quality stover and high moisture grain allows for optimum use of the crop on integrated farms such as combination cow-calf and growing-finishing cattle operations.

Production of wheat that can be used in breadmaking has now been reestablished in Ontario. There is a large market for such wheat in the Province, perhaps as much as 1 million tonnes, and the market is expected to be supplied more and more by Ontario producers over the next few years.

Unfortunately, varieties available at present to farmers are

not fully adapted to the climatic conditions here and the evaluation of new varieties from overseas and, in time, from Provinical breeding programmes is urgently needed. To do this, a co-operative testing network for high quality hard red winter wheat has been established under the auspices of the Ontario Cereal Crop committee and with partial support from the Ontario Wheat Producers' Marketing Board. The network is co-ordinated from **UG** and involves researchers at other institutions across the Province.

A test of 25 potential varieties was planted in the fall of 1985 at each of seven locations. A subsidiary test of 13 varieties was also planted at four locations for study under more intensive management practices. Farmers will soon be able to receive comprehensive information on the performance of these potential varieties in the various regions of Ontario.

As part of these tests, **hard red winter wheat varieties** are being tested at **KCAT**. Initial field observations show that a few strains may be hardy enough to survive winters in Eastern Ontario.

Producers of grains for livestock feed face many problems at the present time: low prices for the product, high costs for many inputs, and deterioration of soil when the major feed grain crop, corn, is grown too frequently. Feed grain crops are urgently needed which cost less to produce than corn and improve rather than damage the soil. Triticale is one such high yielding feed grain crop that holds promise in both these areas. A further step towards exploiting this potential was made this past year when **UG** received support from the Expert Committee on Grain Breeding for the **licensing of the winter triticale line GWT-8 which has been tentatively named OAC-Trillium**. This line has yielded an average of over one tonne per hectare more than current wheats and triticales in tests across Eastern Canada. Such an advance in yields, about 25%, represents a major leap forward for this crop.

A detailed study of the **benefits of research on corn** produced dramatic results strongly supporting previous studies at **UG** on the value of research in agriculture in general. From 1955 to 1981, the total benefits from research on corn were estimated to be $9.6 billion with most of this accruing to Ontario farmers since additions to local production have little impact on price. The benefit-cost ratio was estimated to be a relatively high 65.6 to 1. These results certainly indicate a high payoff for research in this area.

Protein and Oilseed

The **Maximum Yield Research Project at RCAT** had a new high soybean yield in 1985 of 6.5 tonnes/ha at 14% moisture. This was significantly higher, by 0.7 tonnes/ha, than the previous high established in 1983. The main reason for the increase appears to have been the use of a new variety licensed in 1985, Pioneer 9292, which has shorter, stronger straw than varieties used previously. One of the main reasons for reduced yields in soybeans is early lodging which can cut yields by as much as 20%. Pioneer 9292 lodged less and thus yielded more.

A joint project of the New Crop Development Fund, the Ontario Ministry of Agriculture and Food, and the commercial firm Pakasura Ltd. **to examine the feasibility of chickpea production in Southwestern Ontario** was concluded this year. During the three-year research programme at **RCAT**, many aspects of chickpea production were examined. These included variety screening, weed control, foliar fungicides, harvesting techniques, and seed quality. As a result, a basic production package has been worked out and will be tried on several farms during the 1986 season across Southwestern Ontario in one-hectare commercial blocks. Successful chickpea production in Ontario would have an annual gross value potential of $750,000 at current estimates of price and total market.

Over the last few years, there has been an increasing interest in **solid-seeding, direct-harvest production of white beans** in Ontario. The main impetus for the change from conventional production is to reduce the risks of weather-related harvesting difficulties and to attempt to increase the yield potential. In order to make this system successful, there are many factors that need to be examined. At **RCAT** over the last three years, we have examined the effect of seeding rates on the yield and quality of solid-seeded white beans. The results have been quite interesting in that, although total biological yield does not change over a wide range of seeding rates, more of that yield is harvestable with higher seeding rates. As a result, seeding rates of 75-90 kg/ha are suggested for solid-seeding as compared to rates of 45-55 kg/ha for conventional production of this crop.

Direct combining of white beans using a combine equipped with a Crary Air Reel: table remains clear of beans at all times.

In a joint **RCAT-University of Guelph** project, the **potential of determinate, semi-dwarf soybeans in Southwestern Ontario** is under investigation. This type of soybean is vastly different from our standard indeterminate varieties particularly in the way it partitions vegetative and reproductive growth. Determinates generally achieve 80-95% of their full vegetative height before flowering as compared to our indeterminate varieties that usually attain only 40-60% of their final height before flowering. The result is that determinates are much shorter. This reduction in plant height makes them less prone to lodging. As a result, they could be very beneficial on those loam soils where lodging is limiting production. Results to date have been encouraging, and the first of these lines from the breeding programme will be entered in the official soybean licensing trials this year.

An innovative type of reel system was evaluated at **CCAT** for use in direct harvesting of white beans. The **Crary air reel** has been tested and proven successful on 13 other crops, but this is the first time it has been tested in Canada and the first time it has been tested on white beans.

Results from the CCAT field-scale trials showed that combine harvest losses were reduced 51% on average compared to the standard pickup reel, when the air reel was used. Interest among growers in narrow-row production and direct harvesting techniques for white bean is continuing its increase. The hectareage of white beans produced in this manner has increased from 328 in 1983 to 655 in 1984, to 1311 in 1985 and is expected to increase again in 1986.

The **winter rapeseed** crop has increased to an estimated 6880 ha planted in 1985. Growers are very interested in the crop,

especially in the area to the east of Lake Huron. The seed trade has also shown considerable interest.

One indicator of the level of commitment is the ever-increasing number of entries in cultivar licensing trials. One cultivar, Tandem, has been granted a temporary license. Variety trials conducted in 1984-85 were hard hit by winterkill so that very few data were collected. This delayed the potential licensing of a number of low glucosinolate and erucic acid lines of canola. These will be candidates for licensing this year.

Winter rapeseed research at **CCAT** is assisting in the expansion of this crop with work emphasizing the identification of lines with superior over-wintering ability, and the development of crop production systems to enhance winter survival and seed yield through fertility management.

Atrazine residues in soils were monitored from KCAT under field conditions to compare actual results with predicted ones. Research indicates that soybeans can follow corn and atrazine safety in Eastern Ontario if the amount of atrazine does not exceed specified levels. The test will be continued by planting soybeans treated with selected soybean herbicides to detect possible synergistic effects.

Extensive research at **UG** has provided details on **how to improve returns with spring canola**. The production packages include the recommended cultivars Global, Hanna, or Westar, a fine, firm seedbed, drilling 5 kg/ha of seed with a granular insecticide, and packing the soil after planting. Swathing time has had little effect on yields or harvest losses when swathing started after 10% of the seeds in the centre pods on the main stem had begun to change from green to red to brown. Extension promotion of these production packages and the profitability of this new cash crop have led to a near doubling of hectareage in each of the past five years.

Forage

In 1979, a co-operative study between **KCAT** and the Department of Land Resource Science, **UG** was started to **re-calibrate the soil test for potassium on alfalfa**. The field experiments conducted from 1979 to 1983 resulted in a recommendation for a significant increase in potassium applied to alfalfa grown on soils which test low or medium for potassium.

The 1983 calibration table was based on the most economic rate at which to apply potassium given the average prices for it and hay. To accommodate the fluctuating cost/price ratio, a system has been developed to replace the static calibration table with a responsive, dynamic system.

Better safety criteria for silo management will result from a research project on **toxic silo gas production**. Joint research between **UG** and the **Grassland and Forage Research Institute of Braunschweig, Germany (GFRI)** has helped in developing a simulation model. The model will allow accurate prediction of toxic gas formation in silos. Further work at UG and GFRI is expected to set up silage quality criteria such as acid concentration, buffering, and silage stability in addition to gas production rates and times.

Forage crops are increasingly important for Ontario's livestock industry and may become a significant export commodity as well with the development of high density hay bales.

Packaging Ontario's $350 million hay crop into high density modules makes storage and long distance transportation more economical and increases the potential for hay as a cash crop. Transportation in this form to Florida, chiefly for race horses, or other parts of the world may be economically feasible. A breakthrough was achieved recently in tying the module when researchers discovered that over-compression of the hay to 730 kg/m^3 followed by release would allow regular twine to be used when the package expanded to 405 kg/m^3. The latter figure is more than three times the density achieved with regular balers. Co-operation between **UG and the Ontario Centre for Farm Machinery and Food Processing Technology** has yielded a working prototype compactor to do the job which several hay marketing contractors will use this year.

A **record high yield of alfalfa** was obtained in 1985 in forage plots of **UG** near Chatham. Five harvests during the growing season produced 20 036 kg/ha at 12% moisture and 3670 kg crude protein/ha. The previous highest recorded yield was 16 900 kg/ha at the same location; the 1984 Ontario average was 6940 kg/ha.

This record yield was obtained using controls for fungal and insect pests, an intensive five-cut harvest schedule, and adequate phosphorous of 220 kg P205/ha and potassium at 36 kg K20/ha, and selecting a suitable cultivar, Pioneer 532. Neither irrigation nor deep placement of phosphorous and potassium fertilizers contributed to the high yield at this site.

FOOD

PCB's (Polychlorinated Biphenols) are ubiquitous and can be detected in most products of animal origin. Studies carried out by the **Agricultural Laboratory Services Branch** have shown that PCB levels in chicken fat averaged 0.95 mg/kg in 1969-70 and had declined to less than 0.01 mg/kg in 1981-82. A similar decline was observed in egg fat where levels dropped from 0.41 mg/kg in 1969-70 to less than 0.01 mg/kg in 1981-82.

Mean PCB levels of 0.33 and 0.35 mg/kg in abdominal fat of pigs and cattle in 1969-70 had declined to 0.01 mg/kg by 1979 in pigs and by 1981 in cattle. Milk fat levels, first determined in 1970-71 to be 0.080 mg/kg had declined to 0.014 mg/kg in 1985. Measurements made on fruit showed no residues of PCB's to the limit of detection of 0.001 mg/kg.

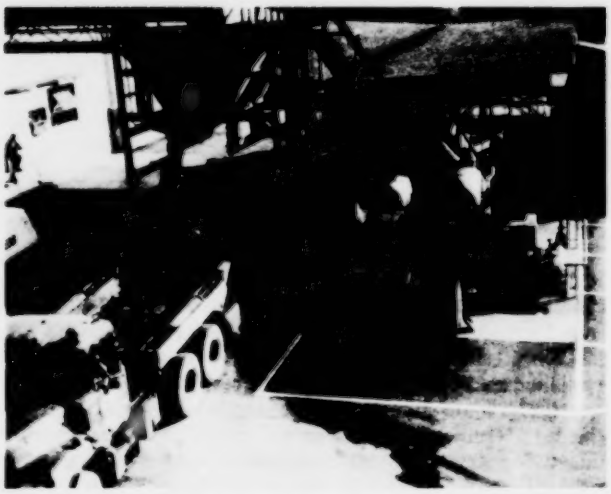
Human adipose tissue and milk fat have shown no consistent change either up or down during the period 1970-1984. The former was 2.5 mg/kg in 1971-72 and 2.1 mg/kg in 1983-84; the latter was 1.0 mg/kg in 1971-72 and 0.83 mg/kg in 1983-84.

Levels in human blood likewise appear to range consistently from 0.007 to 0.012 mg/kg among people not exposed to PCB's in their work. As far as is known, these levels are not considered detrimental to human health.

Sparkling juice from Ontario grapes will be available commercially in 1986. Based on a wide variety of grape cultivars, these new juice products are the result of research on carbonated juices conducted over the last several years at the Horticultural Products Laboratory, **HRIO**, Vineland. New Products from Ontario grapes are an important part of the long-term viability for our grape industry.

Tomatoes with high solids content and excellent paste consistency are in demand by the food processing industry for a number of products such as ketchup, spaghetti sauce, and taco sauce. Analyzing these qualities rapidly is a serious challenge to food scientists faced with evaluating many new varieties each season. The Horticultural Products Laboratory, **HRIO**, Vineland has developed a rapid screening process that takes less than 30 minutes per variety and enables cultivars with the desired solids and paste qualities to be picked out quickly. This allows a large number of cultivars to be screened each season.

A study at **KCAT** on the **effect of post-mortem handling conditions on the tenderness of veal** has shown that a higher conditioning temperatures (16°C) in the first 24 hours after slaughter made the meat more tender. This was the case even with meat which had been hot-boned. Evaluation was by instruments and sensory methods.



Grape pomace being trucked away for disposal: a waste of a potentially valuable material for use in natural food colourant production.

When meat was conditioned at lower temperature (2°C), however, the resulting toughness could be largely overcome by aging of the cuts in vacuum packages. It was concluded, therefore, that hot-boning of veal followed by aging in vacuum packages will make the meat more tender irrespective of the conditioning temperature. This may well be a viable commerical process.

HORTICULTURAL CROPS

Vegetables and Edible Fungi

Experiments have continued at **HRIO, Vineland** on the development of **production technology for exotic fungi**. Several commerical operations began producing Pleurotus (Oyster mushrooms) in 1985 with one marketing 1500 kg per week.

Extensive studies were conducted in 1985 on compost supplementation. Alfalfa meal and soybean meal were each incorporated into spawn-run compost at 7% (meal weight: dry weight of compost). The casing layer was composed of a blend of spawn-run compost and peat. The addition of both materials produced significantly higher yields than the control did over the first four breaks. There was no significant difference between the alfalfa and the soybean meal nor was there any significant difference in size of mushroom for any treatment.

The second harvest was taken in 1985 from an **asparagus trial** planted in 1982 at **HES, Simcoe** to examine **the combined effects of planting roots at different depths and at different spacings between rows**. The five planting depths range from 15-30 cm and the five row widths from 60-120 cm. Yield results to the present show a virtual linear response to both depth of planting and row width with the highest yield per ha coming from the shallowest depths and the closest row widths. The effect of treatments on the average weight of spears were negligible or inconsistent.

Broccoli is an extremely nutritious vegetable for which demand has grown rapidly in the past few years. Ontario growers and researchers are responding with increased production and cultivar and management studies.

Cucumbers have usually been grown at wide row spacings of from 1.5-1.8 m distance. Recently, there has been a trend to narrow-row spacing. Field studies were conducted in 1984 and 1985 at **HES, Simcoe** to determine the **effect of closer row spacings on cucumber yields**.

Cucumbers of the cultivar Bounty were seeded 15 cm apart in rows 0.75, 1.0, 1.25, and 1.5 m apart. As between-row spacing increased from 0.75 to 1.5 m, the average number of fruit harvested increased from about 12 to about 18 per plant; however, the increased number of plants per ha at the 0.75 m spacing more than compensated for the decreased number of fruit harvested per plant.

Yield in dollars and tonnes per ha increased significantly as the between-row spacing decreased. Yields at the 0.75 m row

spacing were about 40% higher than at the 1.5 m spacing in both years. There were no detrimental effects on maturity or fruit quality.

Based on these results, cucumber growers could increase their returns per ha by using a closer row spacing within the limits of the cultivating and harvesting equipment available.

Growers have had problems with **variability in the time taken for shoot of the potato variety Jemseg to emerge**. Both the position of the bud and the degree of apical dominance on the tuber influence shoot emergence when cut seed is planted.. Studies were carried out at **HES, Simcoe** to develop seed management techniques to reduce variability in plant emergence.

Whole tuber controls and apical, basal, and portions cut lengthwise through the apical bud were held for 14 days at 5°C or 10°C prior to planting. Shoots from basal portions of Jemseg held at 5°C emerged some 5 days after apical portions. Holding at 10°C for 14 days decreased the time taken for shoots to emerge. Differences were less for the variety Superior, used as control, as bud growth was visible on most eyes at the time of cutting.

Yield of tubers followed the same pattern over the harvest period. Plants arising from basal portions produced less yield at any given time than apical, lengthwise-cut portions, or whole tubers. Thus, holding seed for 14 days at 10°C produces more uniform emergence and more even yields of Jemseg.

Another project looked at **increasing production of small, whole, seed tubers** preferred for planting Elite-class seed potatoes and recommended for other seed-potato classes. Small, whole seed is also recommended for cultivars such as Jemseg which are prone to erratic emergence when cut seed is used. Yield of potatoes exclusively for small, whole seed is low, particularly with cultivars which set a low number of tubers per hill.

Three years' research using Yukon Gold has shown that yield of small tubers is increased by growing in multiple rows 30 cm apart on 1.5 m centres. Triple-row beds produced the highest yields and were a more efficient use of land. This technique will increase the availability of small, whole seed for Elite seed growers and for cultivars such as Jemseg which are best planted as whole seed.

Several years of tomato trials on **RCAT** plots combined with demonstrations on commercial farms has led to the Ontario industry accepting a **tomato cultivar, Ohio 7814, for canned whole-pack processing**. This University of Ohio selection is firmer and exhibits better colour, capability to remain whole, and flavour, and greater uniformity than cultivars used previously in Ontario. These characteristics result in a better quality canned product.

Evaluation of genotypes and different management techniques at **HES, Simcoe** has resulted in **updated cultivar recommendations for leeks**. Setting of transplants in the field at the bottom of 15-cm-deep trenches which were filled gradually during the growing season gave not only heavier plants, but an extension of the white, edible neck of the stalks as well. During over-wintering trials in which straw mulch was used in the field, the entries Elephant, Autumn Giant, Broad London, and Bluegreen Winter stored very well. Twenty other cultivars showed varying degrees of decay. This practice, using the named cultivars in particular, will allow growers to store leeks in the field for higher prices in the spring.

Fresh-market sweet corn has become much more popular as a crop recently in Eastern Ontario and cultivar evaluation for Ontario is handled at **KCAT**. The research, carried on in co-operation with sweet corn suppliers, evaluates each cultivar for three years.

Although Earlivee, Seneca Horizon, and Flavorvee are still the more common cultivars grown in the Ottawa Valley, some new releases have shown considerable promise in the trials at the College. MTD 482 and Northern Vee, both from Stokes Seeds, were as early as Earlivee, and produced more flavourful and heavier ears. MTD 485, tested at KCAT for four years, is now released by Stokes as North Sweet. This cultivar is as early as Seneca Horizon, and produces a much higher yield of 2750 doz/ha of excellent ear weight. The cultivar CRB028, a new release from Crookman, is comparable to Flavorvee but has much better flavour.

A new cultivar trial evaluating 'super-sweet' sweet corn lines was begun at the College in 1985. Sweet Treat has shown itself to be the earliest one of excellent flavour, quality, and yield.

The 1985 Vegetable Program at **UG** examined a number of species and management practices: mulches, greenhouse and field vegetable crop production, asparagus variety improvement and cultural practices, breeding rutabagas and asparagus, breeding and evaluating potato varieties, magnesium nutrition of greenhouse vegetables, and factors influencing the incidence of black speck in cauliflower curds.

a) The **mulch study** compared plastic mulch with spray-on liquid latex mulch supplied by Polysar. Results indicated that the latex mulch did not damage the vegetables even when applied at high rates. These preliminary studies did not, however, indicate that the vegetable crop responded any better to the latex than to the plastic mulches.

b) **Cultural studies in greenhouse tomatoes** indicate that the use of nutient film technique (NFT) and rockwool increases yields considerably over soil-grown plants. Plants grown by NFT or in rockwool at cooler air temperatures with warm root temperatures can produce yields similar to those grown in a warmer greenhouse. This suggests energy saving without yield loss.

c) Studies in **asparagus variety assessment** have identified the new cultivars Lucullus Midseason and Jersey Centennial that are adaptable to many parts of the country. This has led to the establishment of a cloned seed field to produce Rutgers Jersey Centennial on the University's Cruickston Park Farm. Thus for the first time in 40 years, asparagus growers in Canada will be able to obtain a new cultivar more adaptable to our environment.

d) Studies are continuing to develop **atrazine-resistant rutabagas** as well as other cole crops. Although progress is slow, some headway is being made in obtaining atrazine-resistant genetic material that can be transferred to the different cole crops.

e) The **potato cultivar trials** conducted in different parts of the Province were assessed for chip and culinary characteristics. The No. F72217 line shows promise at Cambridge as a 'first early' type of culinary potato. Conestoga (Guelph cultivar) consistently has produced good coloured potato chips in early harvest at Simcoe and Harrow. The most promising potato seedling observed at Guelph for chip quality was the Michigan seedling M5002-171Y. In 1985, the Ontario Potato Cultivar Evaluation Association (OPCEA) was formed to develop profiles for different cultivars. Trials were held with growers and processors at the Simcoe Research Station, Harrow Research Station, and the University of Guelph. Studies were also begun at UG for the rapid production of *in vitro* micro-tubers of potatoes.

Fruit

Production and economic data from peaches grown at HRIO, Vineland in the Protected Environment Structure and in the field have been collected for three years. Accumulated yield from 1.0 m, Tatura-trained trees of Redhaven peaches was 80% more than that of 1.0 m, Tatura-trained ones

in the field and 90% more than standard-spaced, field-grown trees. Comparisons of protected and field-grown trees gave the following results: a) protected: field grown yield in tonnes/ha by years: 1983 - 42:11, 1984 - 38:25, 1985 - 54:37; b) a higher percentage of marketable fruits from protected than from field-grown plots; c) 1985 direct costs of production of $44 491/ha or $941/t for the PES and $14 513/ha or $487/t for field grown trees; and d) gross margin of $18 662/ha for the PES and $6815/ha for fieldgrown trees.

Grafted Hayward kiwifruit vines planted in the Protected Environment Structure at HRIO, Vineland during 1981 at a 3.4 × 6.1 m spacing have grown vigorously and fruited heavily under the environmental conditions created for protected peach culture. The vines were trained in the summer and pruned in winter onto a 'T-bar' trellis converted in 1985 to a pergola trellis. Yields were 5 t/ha in 1983, 19 t/ha in 1984, and 47 t/ha in 1985. In New Zealand, commercial plantings are expected to yield about 24 t/ha. The 1985 fruit, harvested at a firmness of 16.4 psi and 9.2oBrix (solid solubles or sugar), was the equivalent of 12 624 trays/ha.

An active programme is underway at **HRIO**, Vineland **to develop improved wine and fresh market grape cultivars**, with 28 controlled crosses in 1985. The 1980 and 1982 seedlings constitute the bulk of unselected seedlings in the vineyard (approximately 1100), with an additional 190 seedlings in the nursery and 4100 seed to be sown in January 1986. The present inventory of 162 named cultivars, 87 French hybrids, 112 unnamed selections from external breeding programmes, 200 unnamed selections from the HRIO breeding programme, 17 miscellaneous selections from private collectors, 39 rootstock cultivars and numbered selections, and 8 species selections. In the next 6-10 years, researchers can expect to develop one or two named varieties from this material for commercial use.

In 1974, an experiment was established at **HRIO, Vineland** with Bartlett pear, a compatible strain, on clonal Quince A root **to determine the effect of spacing and training on yield and processing grade of Bartlett**. This experiment consisted of 9 spacings, 2, 2.5, and 3 m within and 3, 3.5, and 4 m between rows, and 3 training systems, free-standing, supported, and Palmette. Irrespective of training system, yield from trees at the closest within-row spacing was 16% higher than those set at 2.5 m and 26% higher than at 3 m. The freestanding trees yielded 17% higher than those which were supported and 20% higher than those under the Palmette system. The training system did not affect the processing grades nor did different tree densities.

In 1973, an observational trial was planted at **HRIO**, Vineland **to compare the performance of the tart cherry cultivar Montmorency on 3 different rootstocks and at several tree densities**. Trees on *P. fructicosa* seedling roots were planted at 447, 538, 671, and 896 trees/ha at spacings of 1.8, 2.4, and 3.6 × 6 m. Those on *P. mahaleb* and Montmorency seedling roots were planted at 233, 266, 335, and 447 trees/ha at spacings of 3.6, 4.8, 6, and 7.2 × 6m. Tree survival was excellent on *P. mahaleb* and Montmorency seedling rootstocks, but very unsatisfactory on those of *P. fructicosa*.

The cumulative yield for Montmorency on *P. fructicosa* during the 1976-1983 cropping years was highest at the highest density planting of 896 trees/ha. No significant differences were observed among the other tree densities. In 1983, 40% to 50% of the trees in this planting were dead. In general, *P. fructicosa* is not practical rootstock for Montmorency even though it lends itself to a very high density planting because of its size-controlling effects.

Accumulated yield was significantly lower where trees were planted at 7.6 × 6 m and 233 trees/ha and higher at 3.6 × 6 m and 447 tree/ha. Montmorency seedling roots will exert a good degree of size-control on scion cultivars without affecting the cropping potential.

The efficacy of chemicals to prevent salt-spray injury to roadside trees was evaluated at **HRIO**, Vineland. During the winter of 1984-85, 18 chemical protectants were sprayed at intervals on two apple cultivars, Empire and Golden Delicious. Fifteen protectants were sprayed on white pine trees. Evaluations based on injury ratings of twigs and on the content of Na^+ and Cl^- on twigs inidicated that eight of these protectants were effective in reducing injury on apple trees and five were effective on white pine. A few of the products showed mild phytotoxic effects on white pine, but not on the apple trees.

A six-year soil management study for highbush blueberries at HES, Simcoe has shown that various soil management techniques will improve yield in the early years of a plantation. The treatments giving the highest yields were those where peat was incroporated into the soil (pH 4.5) before planting, the plants mulched with sawdust and irrigated, and the ground between the rows grassed. This study shows that with good soil management blueberries can be grown successfully in the sandy soils of Haldimand-Norfolk County.

Two experiments in progress for four years at **HES, Simcoe**, have shown **significant increases in production for Northern Spy trees treated with Alar** shortly after bloom or with a mixture of Alar + Ethrel around July 1 each year. These treatments have been about equally effective in increasing cropping, decreasing the costs for dormant pruning, and in helping maintain a smaller tree. Yield increases of from 37%-100% have been recorded over the period of the trial.

After six years of evaluation at **HES, Simcoe, the candidate rootstock MAC 9 appears very promising for commercial orchard use**. This rootstock produces a fully dwarfed, highly productive tree. One of its major advantages is that it can support the tree without a pole or trellis paving the way to high-density orchards of free-standing trees. MAC 9 has been available for commerical use in Ontario since 1985 and studies at Simcoe have led to an understanding of the cultural requirements necessary to manage trees properly on this rootstock.

Most commercial apple trees in Ontario are now grown on size-controlling rootstocks, of which three types are shown here. MAC-9, a fully dwarfing rootstock, has been available commercially since 1985, but management methods have now been refined to meet its particular requirements.

A **Raspberry Cost Study** was conducted in 1984 through the **EPC Branch** by means of a meeting of producers, Ministry horticultural crop advisors, and Branch economists. Costs were determined for establishing a raspberry planting and for yearly production and harvesting. In 1983, Ontario had 245 ha in fruit-bearing and 28 ha in non-bearing raspberry production with total production of 485 000 kg valued at $1 862 000.

The study showed that it costs over $10 000 per ha to establish a raspberry patch, which normally has a productive life of five years. At the provincial average yield of 2118 kh per ha, overall costs average $5.65 per kg for commerical growers who offer ready-picked fruit for sale and $3.97 per kg for pick-your-own operations. Growers who achieve only average yields would not break even at current prices.

In a commercial harvesting system, a yield of 2980 kg per ha is needed to cover all costs at a price of $4.73 per kg. Pick-your-own operations break even at a yield of 2746 kg per ha when the price is $3.14 per kg.

Effective machine harvesting of fresh market and processing strawberries has long been a goal of the industry. Trials concluded at **UG** this year showed that experimental varieties suitable for cap-free picking are available. Data showed that 40% to 50% of the strawberries picked with a stripper type of harvester were free of their caps when they came from the field. This process reduced the capital and operating cost of a decapper. The stripped harvester is particularly suitable for small growers.

Ornamentals

Environmental factors influence markedly the rooting performance of Juniper cuttings. During the 1984-85 winter investigations were carried out at **HRIO, Vineland** on the rooting of cuttings from four genotypes of *Juniperus sabina*. Five propagating media were used, sand, 1 sand:1 perlite, 1 sand:1peat, 1 peat:1 perlite, and peat, and two light regimes, natural daylight and a 16-hour photoperiod provided by 400-watt high intensity, discharge sodium lamps. Ambient greenhouse air temperature at night was set at 16°C and Root Zone bottom heat provided 21+/−°C at rooting level. Cuttings were treated with StimRoot No. 3 powder of 0.8% indolebutyric acid.

Rooting generally was best in the sand-perlite medium followed closely by the peat-perlite mixture. In comparison with natural daylight, the extended light regime increased rooting by 0-26% depending on the Juniper genotype. A high pH of 7.8 in the sand-based media and a low pH of 3.5 in the peat-based ones might have influenced rooting, but further research is required to clarify this point.

Four experiments were conducted over a two-year period at **HRIO**, Vineland to determine the effect of paclobutrazol use on **pot chrysanthemums**. A 'tall' cultivar grown in the summer was exposed to one, two, or three spray applications in concentrations of 50, 100, or 200 ppm ai. and compared to single-drenching applications of 0.3-2.5 mg ai. per 15 cm pot.

Results based on the amount of active ingredient applied per pot indicate that spraying is less effective than drenching for controlling stem length. Spraying at 50 or 100 ppm once or drenching with 125 mL at 2.5 ppm ai. seemed suitable. A-rest (ancymidol) was as effective as paclobutrazol both as a drench and a spray using similar concentrations.

In the second experiment, paclobutrazol was compared with daminozide (B-9) in multiple spray applications on short, medium, and tall cultivars and was found to be more effective. There was a strong correlation between the effectiveness of the growth regulator and the delay in blooming.

In the third experiment, the timing and phytotoxicity were tested on seven different 'tall' cultivars using 200 ppm ai. and a single spray. The later the application, the smaller the effect on shoot development. No phyotoxicity was observed at 200 ppm ai. paclobutroxol, but the plant's growth habits were uneven.

In the fourth experiment, single applications were carried out at different stages of the shoot development, at 1, 2, 3, 5, and 7 cm, on both 'tall' and 'short' cultivars. Two concentrations were used for the spray and one for the drench applications. For the 'tall' cultivars, the spray applications were more effective than the drench at any stage. For the 'short' cultivars, there was no difference between the two methods.

PEST MANAGEMENT AND DISEASE CONTROL

Weeds

Soybean weed conrol research at RCAT strongly supports the traditional practice of inter-row cultivation combined with herbicide application to maximize gross margin returns per hectare. Three years of yield and weed control data from soybean trails were compared using gross margins per ha at 1985 costs and returns. Gross margin represents the amount of dollars left after operating costs to cover fixed costs and the return to the grower.

Herbicide threatments were compared to row cultivation and to herbicides plus row cultivation. With herbicides only, there was 68% weed control and a gross margin per ha of $79.75. With cultivation only, there was 66% weed control and a gross margin per ha of $157.92. With herbicides plus cultivation, 94% weed control was achieved with a gross margin of $208.65 per ha. This is a 162% increase in gross margin over herbicides alone and a 32% increase over cultivation alone. (With neither herbicides nor cultivation, weed control was nil and gross margin $56.65 per ha.)

Inter-row cultivation may improve yields, and hence gross margin, in several possible ways: by activating herbicides, controlling weeds if herbicides fail because of weather conditions, aerating soil, breaking soil crust, slowing down moisture evaporation, or improving moisture absorption. The combination of herbicides and cultivation clearly offers the best potential profit to soybean growers.

A project was begun at **HRIO**, Vineland to **improve through breeding the field resistance of peach varieties to Cystospora canker** *(Leucostoma spp.)* and to **determine the inheritance of canker resistance in peach**. Initial results from Agriculture Canada, Vineland laboratory studies have shown that the amount of peach canker was inversely related to the amount of suberin (a fatty substance in many plant cell walls) found in tissues surrounding bark wounds. The Vineland selection V68101 was identified as a potential source of canker resistance. Through embryo culture, 1936 embryos were extracted from controlled crosses in preparation for spring 1986 planting.

Broadleaf weeds are a serious problem in the production of most vegetable crops. **Finding satisfactory control for these weed types** poses a major challenge since, in many cases, the crops and the weeds are closely related as, for example, nightshade in tomatoes or peppers.

Field studies held at **HES, Simcoe** show that diethatyl ethyl (Antor 4E) gives excellent control of nightshades and galinsoga which are two of the most troublesome weeds in vegetable crops. Results to the present with applications after planting of diethatyl ethyl on peppers, cole crops, garlic, and asparagus are very en-

couraging. No crop damage or yield reductions have been observed even at rates much higher than those required to get satisfactory weed control.

Oxyfluorfen (Goal) is another herbicide that has given excellent conrol of all broadleaf weeds with no crop damage or yield reductions when it is applied on the soil before cole crops are planted. Metolachlor (Dual) also continues to show promise for nightshade control when applied after peppers and cole crops are planted.

Control of quackgrass in tomatoes has never before been possible. Now a combination treatment is available, thanks, in part, to field trials conducted at **RCAT**. Work there helped in the 1986 recommendation of sethoxydim (Poast) + ammonium sulphate + Assist oil concentrate for the control of the persistent perennial quackgrass and the annual grasses in transplanted and field-seeded tomatoes. This treatment will not injure the plants and is reasonably cost-effective.

Crabgrass, an annual grass in lawns, has been controlled primarily by several pre-emergence herbicides. To do this, the homeowner had to anticipate a problem and treat it in early spring. Research at **RCAT** indicates that a post-emergence herbicide, Hoe 33171, controls crabgrass successfully in the 1 to 6 leaf stage without injury to Kentucky bluegrass or Creeping Red Fescue, the main turf grasses.

Triazine-resistant lambsquarters, as well as other triazine-resistant weeds, have become a challenge to the corn grower who has relied heavily on combination of atrazine and/or Bladex (cyanazine) with one of the grass herbicides for broad-spectrum control. Incorporating these ahead of planting was an easy method. The testing of many combinations in field corn at **RCAT** has led to the registration and recommendation of new treatments including such herbicides as Torch, Sabre, and Banvel against which these weeds are not resistant.

Weed control is a major expense in **establishing cultivated blueberries in Ontario**. Greenhouse and field trials conducted at **KCAT** show that transplanted lowbush blueberries are tolerant of many herbicides.

Primextra, Sinbar, Linuron, and a combination of Sutan and Atrazine gave excellent control of annual grasses and broadleaf weeds as well as being of minimal phototoxicity to the blueberries. The herbicides had no detrimental effect on top growth, but rhizone development and root growth were suppressed in some cases.

It is doubtful that alachlor will continue to be available for use in corn and soybeans. Promising results at **UG**, however, with **SC 0021 and Mon 097 for control of proso millet and other germinating weeds** indicate that there may be more than one replacement for alachlor, at least for some weed species. In other research at UG, **tridiphane** was found to synergize the activity of metazachlor and other chloroacetamide herbicides for the control of proso millet and other grassy weeds.

In research on soybeans, **dimethazone** was a particularly exciting new treatment. Applied before plants emerged, it provided good control of quackgrass without crop injury. Such a treatment could be extremely useful in a number of broad-leaved crops as well as beans.

In studies at **UG, triadimefon, a new growth regulator**, is proving to have many useful effects on plants. Under water stress conditions, for example, it increases yields of soybeans and peas. In addition, it has fungicidal properties and can protect plants from drought, chilling, and ozone injury.

For many years, Ontario **onion growers** have had a well-established and effective chemical **weed control programme**. This has been based on allidoclor and ioxynil for early and late season control. After the 1986 season, however, these herbicides are not expected to be available, and it is not economically feasible to grow onions on organic soils without chemical weed control.

In a three-year-long, co-operative study between **UG and the Muck Research Station** at Bradford, the sequential use of propachlor, oxyfluorfen and/or sethoxydim has proven to be an effective means of controlling weeds in onions on muck soils. Provided toxicology questions can be answered appropriately, an alternative programme may be available by the time stocks of allidochlor and ioxynil are depleted.

By elucidating the mechanisms and genetics for resistance in weeds to atrazine, **UG** researchers have successfully transferred this trait to new varieties of rutabaga. With these new varieties it is now possible to use **triazine herbicides to control wild mustards selectively in the rutabaga crop**. This research has also developed and introduced a new field extension tool, a portable fluorometer, which can be used to detect weeds that are resistant to photosynthetic inhibitor herbicides.

Insects

About 400 000 ha of field corn are treated annually in Ontario with granular insecticide for **control of corn rootworms**. This hectareage could be reduced with an **effective integrated pest management (IPM) programme**. One requirement of such a programme is an effective method of estimating rootworm populations. Two years of testing various sampling methods at **UG** has resulted in an economical and reliable monitoring method for the rootworm beetles in Ontario fields.

Two general methods were tested: counts of beetles on whole corn plants or in the ear zone, and various sticky traps. Counts were cheaper and less variable than results with sticky traps. Because counts of beetles per whole plant best met the requirements of speed, reliability, and cost of estimates, sequential sampling of whole plants was investigated to reduce further the sampling costs for this method. Three sequential-sampling plans were developed using plant counts made in 1984 and were tested in 20 fields in August, 1985. With one of these methods, the number of samples was reduced by 55% in first-year fields and 48% in second-year fields. This represents a significant reduction in the cost of making management decisions in cornfields. This method will be recommended for use in the Pest Management Program under development for Ontario field corn.

Researchers have long recognized that sanitation should be the cornerstone of housefly control in barns, but producers have not had clear guidelines as to how often and where to use sanitation procedures, the costs involved, or the efficacy of sanitation. An **economic evaluation of sanitation for dairy farms** has now been completed at **UG** which determined that [illegible] housefly reductions could be achieved with proper sanitation procedures for about $315 per season.

The study showed that calf pens were the main source of fly maggots; about 70% of flies came from these pens whereas heifer pens and the manure pile outside were not major sources. Under warm summer conditions, flies could develop to adults in as short a time as ten days. This indicates that farmers must clean out the pens every week. For a typical herd of 40 milking cows, this requires about three hours of labour per week.

Turfgrass scale is a new pest in North America. The insect was found in lawns, parklands, and sod farms in 1981 and **UG** has now determined the biology and importance of it in Ontario.

The pests overwinter as mature nymphs in the root systems of grasses, move up into the thatch in the spring, and there are

Integrated Pest Management in apple orchards: an increasingly important tool for economic production.

adults by early June. Females lay masses of 40 to 80 eggs which hatch to produce reddish crawlers. These can be so numerous in early July that the grass is reddish. In fact, the pest status of the turfgrass scale is largely because of the nuisance caused by the crawlers. These feed and mature to fully grown nymphs over the summer and then overwinter.

The scale attacks perennial bluegrass, creeping bent, red fescue, and rye grasses. Common turfgrass insecticides such as diazinon and chlorpyrifos are only partly effective.

The stringent requirements for pesticide registration in Canada have meant that industry is obtaining adequate data for registration only for crops on which major use is anticipated and a market assured, based on significant hectareage. This means that pesticides for so-called small 'minor' crops are not registered in Ontario. Residue data are an essential requirement for registration. In co-operation with the **Provincial Pesticide Residue Testing Laboratory, UG** has obtained **residue data on some pesticides Ontario producers need for some minor crops.**

These data were obtained recently for several insecticides on celery, lettuce, onions, carrots, peanuts, green bush beans, and strawberries. They have been used by private industry and registration authorities to pursue registrations under the federal Pesticide Act.

Disease

Cavity spot of carrots is an important factor limiting the production of this valuable vegetable in the Bradford and district marshes. Crop losses have been reported as well from Israel, Scotland, England, and California.

Previous attempts to control the disorder have been complete failures. The casual agent and conditions affecting cavity spot formation were both unknown. In 1985, however, for the first time in 20 years, the **Muck Research Station** obtained encouraging preliminary results from experiments which appear to indicate that the fungus *Pythium* could be involved.

Seed treatments and granular treatments in the furrow with a systemic fungicide *Metalaxyl* gave sufficient control for all the carrots to be marketable. In contrast, 74% of the carrots in the untreated check plot developed cavity spot.

As soon as the fungicide has been proven effective under commercial conditions, and if registration for use is achieved, there will be estimated benefits to the carrot industry of about $1 million per year.

SOIL, WATER, AND WASTE MANAGEMENT

Research was carried out at **RCAT** in 1985 on two soil textures with corn and soybeans under high yield conditions (9.4 tonnes/ha of corn and 3.4 tonnes/ha of soybeans). This was the third year that this research had been conducted with corn and the sixth with soybeans.

The research in 1985, as in previous years, continued to show that present phosphate and potash recommendations from the OMAF soil test are sufficient for the highest economic yields under high yield conditions.

These and other results from Ontario do not indicate that additional phosphate and potash is required for optimum yields at high yield levels. This is contrary to recommendations from many commercial laboratories in the United States. By following OMAF recommendations rather than those from American commercial laboratories, Ontario farmers can realize their highest economic yields and profits.

In time of financial constraint, farmers can be assured that they **do not need to add micronutrients routinely in fertilizer for optimum yields**. Micronutrient research at **RCAT** has shown no yield increases for high-yielding corn crops, of 8.4 tonne/ha, from the use of either zinc or boron.

Winter wheat and white beans have shown no increase either in yield from the use of zinc, manganese, or copper applied broadcast or foliar. This represents a saving of from $12.00 to $25.00 per ha depending on the number and source of micronutrients applied.

On the other hand, soybeans have returned $29.63 per dollar spent on manganese sulphate where the soil was deficient in manganese.

Agricultural Laboratory Services Branch sampled wells on 91 farms across Southern Ontario. Of these, 86 farms used herbicides, 52 used insecticides, and 25 used fungicides. The well water on 43 of the farms was used to apply pesticides.

Twelve of the 91 farms showed contamination with eleven containing atrazine. Six of the 12 wells had low levels of atrazine, 1 ug/L, and appeared to have become contaminated from runoff waters entering the well. The other six appeared to have become contaminated as a result of spills into or around the well. One was seriously contaminated with four herbicides and one insecticide.

Normal use of pesticides does not contaminate ground water; however, unprotected wells can become contaminated by runoff waters. The most serious contamination of ground water is from spills and accidents into and around wells.

More vineyards are being levelled before planting to improve water and air drainage and to facilitate the operation of equipment. A survey was conducted in 1984 from **HRIO**, Vineland to study the **effects of levelling on nutrient uptake and soil characteristics.**

Petiole and soil samples were taken from levelled and unlevelled areas. In most vineyards, growth of vines from levelled sections was less than from unlevelled areas, but there was no consistent difference in macro- or micro-nutrient composi-

Permeameter being used in the field.

tion of petioles. Mg tended to be higher and Ca lower in the petioles of vines from unlevelled areas.

Paper mills in the Niagara area must dispose of sludge, a waste product of their operations. Unlike municipal sludge, the mill waste is low in heavy metals and high in wood fibres. Clay loam soils used for grape and corn production in the region benefit from organic matter additions which improve soil structure, aggregate stability, and water movement.

Initial tests conducted at **HRIO**, Vineland with primary sludge showed a lack of nitrogen in the soil when sludge was the only source. At the other extreme, secondary sludge applied at high rates could cause excessive growth and lodging of plants. Fruit set might also decrease with excessive nitrogen from this type of sludge.

In the greenhouse, growth as measured by plant height, fresh and dry plant weight, and number and area of leaves of tomatoes, corn, and lettuce was increased with each increment in the rate of sludge up to 25% of the volume of the mix provided extra nitrogen was supplied as well at the rate of .36 or .67 g N/100 g sludge. Growth was also related directly to the nitrogen rate up to .67 g N/100 g sludge. Increasing primary sludge rates to 37.5 or 50% of the volume of the mix reduced growth in all three crops. This may be caused by the high pH, high salt concentrations, or reduced water movement with mixes of over 25% sludge.

A new **automated weather station** is now in operation at **RCAT** replacing the manual system used for over 55 years. At 0800 hours, an IBM XT computer is automatically turned on to interrogate the 21 X Campbell Scientific data logger located at the weather station site 2 km away through a telephone line. Data are stored and summarized for use at the Atmospheric Environmental Services, Agriculture Canada along with weekly and daily reports by OMAF staff.

Besides these traditional methods of reporting weather data, there is a new emphasis in the research community to utilize this information in helping Ontario growers. Temperatures can be used to calculate degree-days which, when accumulated throughout the season, can alert growers at an early stage to possible pest problems. Rainfall, leaf wetness, and temperature can be used to develop plant disease forecasting models so fungicides can be applied only when needed. Solar radiation information can aid in scheduling irrigation. Data on barometric pressures can help livestock operations manage ventilation systems. Wind speed measurements, soil temperature, and rainfall help explain the actions of herbicides after application. Winterkill on fruit trees and certain field crops can be determined using winter weather parameters; and so forth. The use of weather information is virtually limitless.

An automated weather system provides for a rapid assembly of these important data with reduced labour. Both these factors encourate the use of the information for the benefit of Ontario growers.

The **Guelph Permeameter** was designed at **UG** for use in the field to measure soil permeability, that is, the rate of water flow through soil Such measurements are useful when septic, farm drainage, irrigation, and landfill site systems are being designed. Current methods such as infiltrometer or percolation tests do not account for sorptive forces of water in soil, and consequently, often seriously overestimate permeability. Overestimations can be anywhere from 1.5 times for a sandy soil to 50 times or more for a clay soil. The Guelph Permeameter's wide use is assured as it is cost effective, rapid, accurate, and portable.

Soil structure degradation is considered more and more as a factor limiting yields especially on finer textured soils in Ontario. Structure can be changed by tillage or compaction by heavy vehicles or by wetting and drying of soil. Aggregate stability is a characteristic of soil structure which is considered important for crop growth. **An index for wet aggregate stability** was developed at **UG** based primarily on the distribution of aggregate sizes. The index was used to show that significant soil structure deterioration occured rapidly with two years of corn following bromegrass. In addition, the restoration of soil structure with bromegrass following corn appeared to be a relatively slow process. This index can be used to assess soil structure and thereby assist in making recommendations for improving the physical state of soils.

The gradual shift from forage crops to row crops has led to an increased decline in organic matter content of our cultivated soils and, concurrently, a deterioration in soil physical properties. Using carbon-14 as a tracer to follow **below-ground plant dry matter contributions to soil organic matter**, researchers at **UG** estimated that bromegrass contributes 5600 kg dry matter/ha whereas corn contributed about 1200 kg/ha to the plow layer annually. Approximately one-half of the C contributed by the crop was in the roots and the other half was released from roots during growth into the soil.

Improvements in aggregate stability were correlated with the increased rooting. After decomposition comparable to the cumulative soil temperatures found between April and October, 3500 kg dry matter/ha remained with bromegrass residues, but only 700 kg/ha remained with corn residues.

This study has shown that increased additions of dry matter to the soil from a crop such as bromegrass, coupled with a slower rate of loss through mineralization, could make a major difference in the contribution of crops to soil organic matter and hence to soil structure (See previous item).

Organic soils used for crop production are commonly regard-

ed as a resource which is wasting away because of **subsidence**. Subsidence is caused by wind erosion, soil consolidation following drainage, and mineralization of the organic matter by micro-organisms.

A 30-year study at the Bradford Muck Research Station, involving researchers from **UG** and the **Muck Station**, indicates that there has been subsidence of 1.5 m since 1925. Measurements since 1958 show a 0.48 m subsidence, while, from 1980 to 1985, subsidence has been 0.016 m.

Soil consolidation following tile drainage in 1957 appeared to be a major contributor to the subsidence whereas a new drainage system installed in 1975, which allows virtually complete control over the water table levels, has reduced subsidence significantly. Although it continues, the rate is diminished gradually. This information should be useful in predicting the longevity of organic soils and of looking at ways to extend their life.

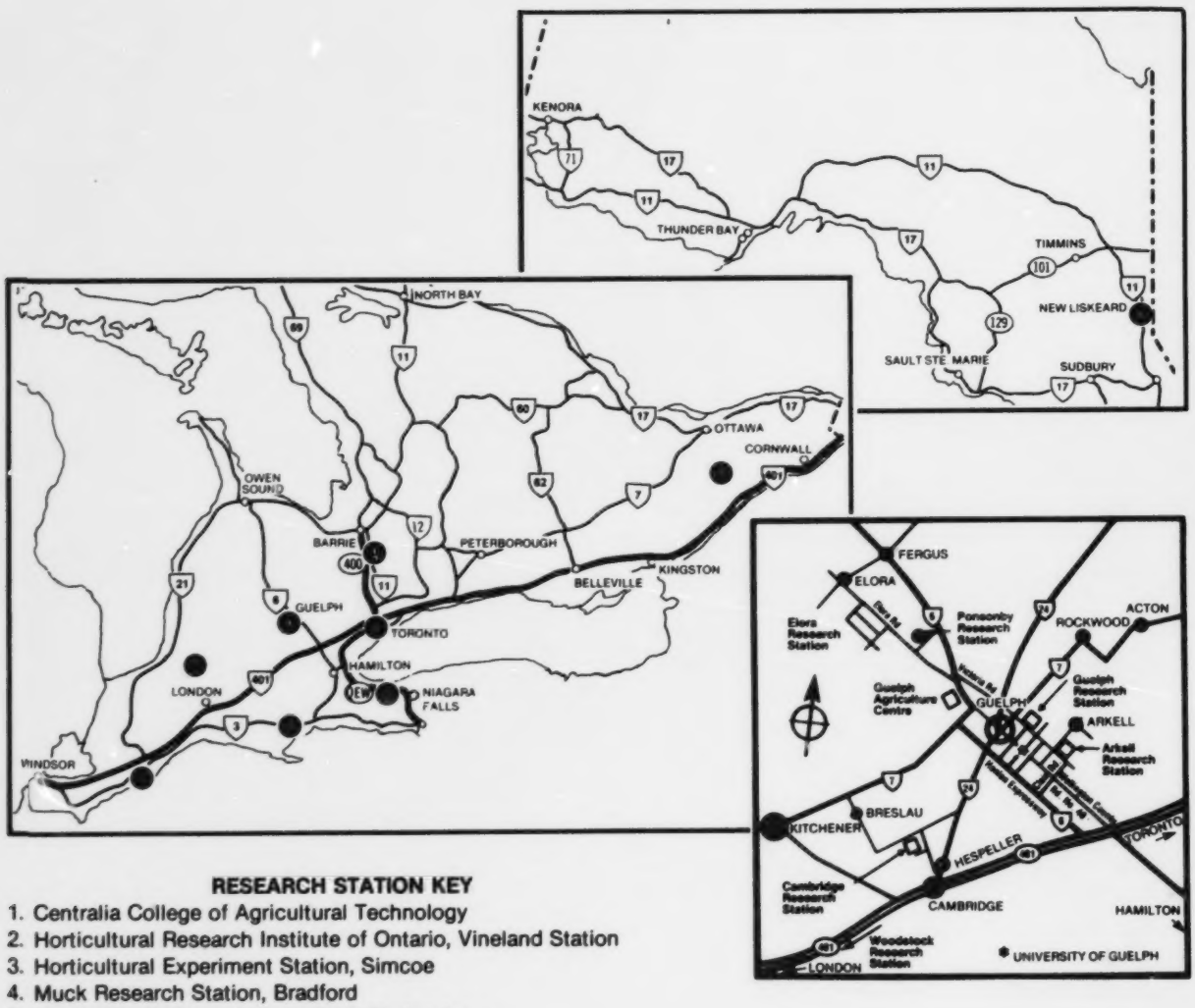
Appropriate technology to screen the impact of pesticides on aquatic systems has been developed and tested during the last four years at **UG**. The use of this technology promises long-term benefits to society, the environment, regulatory agencies, industry, and the scientific community. The methodology has allowed the observation of the effect and the recovery from pesticide exposure in natural aquatic ecosystems. Many of these effects would not have been observable in laboratory experimental systems in which only a small number of species can be examined.

Studies in the field of soil erosion continue to be emphasized in research at **UG**. **A watershed transport model** has been added to the model on watershed soil erosion predictions previously developed. This will provide a much needed predictive capability for the sources of phosphorus entering small upland streams. Strategies for soil erosion control are being evaluated using models adapted to micro-computer operation. These developments promise to provide appropriate government agencies with effective teaching and management aids.

The impact of land drainage on amounts of stream flow and timing of peak flows is under investigation at **UG**. Initial investigations focus on the development of a base for historical comparisons. Historical flows of a century ago for a representative main drain or stream and resulting from land-use patterns of that period, including drainage, are being recreated using a model that will also be applied to contemporary conditions for the same drain and drainage area. Results from these investigations will then provide a model reference system for predicting the impact of changes in current drainage practices on stream-flow characteristics.

INVENTORY OF AGRICULTURAL RESEARCH PROJECTS

The inventory of Agricultural Research Projects contains all projects that were active during the fiscal year 1985-86. All those shown were funded completely or in part by the Ontario Ministry of Agriculture and Food. Those at the University of Guelph are carried out under an agreement with the Ministry.



RESEARCH STATION KEY

1. Centralia College of Agricultural Technology
2. Horticultural Research Institute of Ontario, Vineland Station
3. Horticultural Experiment Station, Simcoe
4. Muck Research Station, Bradford
5. Kemptville College of Agricultural Technology
6. New Liskeard College of Agricultural Technology
7. Ridgetown College of Agricultural Technology
8. University of Guelph, and Agricultural Laboratory Services (OMAF)
9. Economics and Policy Coordination Branch (OMAF, Toronto)

AGRICULTURAL LABORATORY SERVICES

The Provincial Pesticide Residue Testing Laboratory is one of three sections of Agricultural Laboratory Services. The research objectives are to improve and amend pesticide registrations and recommendations in order to reduce residues below the negligible level of 0.1 mg/kg whenever possible. The physical dispersal, chemical breakdown, and microbiological degradation of pesticides and toxic metabolites are monitored in order to set pre-harvest intervals for application. This research aids in our general understanding of the fate of pesticides in the environment and in food.

Studies on the hazards of re-entry into treated areas, which include monitoring the absorption and excretion of pesticides by those who use them, help minimize the risk of applying pesticides.

PROJECT TITLE	RESEARCHER
ANIMAL PRODUCTION	
Translocation of topically applied insecticide on bovine	Surgeoner, Braun
FIELD CROPS	
Monitoring flue-cured tobacco and soils on 34 farms for pesticide residues and metal contents	Frank, Braun, Ripley, Clegg, Suda, Zilkey
Use of metalaxyl in tobacco production.	Ripley, Gayed
Terminal residues of herbicides in canola and rutabaga	Frank, Clegg
Disappearance of fungicide from cereals	Ripley, Frank, Sutton
HORTICULTURAL CROPS	
Dissipation of pyrethroids from muck crops	Braun, McEwen, Frank
Dissipation of insecticide residues from minor crops, asparagus,carrots, onions	Frank, Braun, McEwen
Dissipation of chlorothalonil, triadimefon and carbofuran in cucumber	Ripley, Jarvis, Fisher, Ingratta
Daminazide and paclobutrazole residue disappearance in apples	Lougheed, Ripley
Metalaxyl residues in potato production	Ripley, Edgington
Dissipation of fungicide residues from minor crops - celery, lettuce, strawberries	Ripley, Ritcey, Edgington
Fungicides for protection of carrots against storage rots	Ripley, Edgington, MacDonald
Iprodione residues in fruit production	Ripley, May & Baker
SOIL AND WATER MANAGEMENT	
Degradation of triazines and acyl anilides in soils of different organic content and held at different temperatures	Frank, Clegg, Anderson
Modelling of atrazine runoff	Ripley, Eddie, ICE Beak Consulting Ltd.
Monitoring shallow and deep wells for pesticides	Frank, Braun, Ripley, Clegg
Monitoring surface water for pesticides	Frank, Braun, Clegg, Ripley
Stability of pesticides in water	Clegg, Ripley Frank, Chapman
ENGINEERING	
Drift studies with aircraft and ground equipment	Frank, Braun, Morrow, Miller, Ripley
Analytical method and development for new fungicides and herbicides	Ripley, Clegg
HUMAN EXPOSURE	
Following the changes in organochlorine residues in Ontario residents over the decade	Frank, Braun
Testing filters	Frank, Braun, Ripley
Re-entry into treated crops	Frank, Braun, Ripley, Ritcey
FOOD AND FOOD QUALITY	
Monitoring animal tissues for pesticide residues and metals	Frank, Braun
Monitoring milk supplies in Ontario for pesticide residue	Frank, Braun
Monitoring Ontario grown fruit and vegetables for pesticide residues	Frank, Braun, Ripley, Wheeler
Monitoring alcoholic beverages for ethyl carbamate	Clegg

CENTRALIA COLLEGE OF AGRICULTURAL TECHNOLOGY

Centralia College of Agricultural Technology is set in the heart of Western Ontario's diverse and productive agricultural region.

A 60-hectare research and demonstration farm was purchased near the college campus in 1985. Consolidation of trials from off-campus locations, a system of plot rotation, and some expansion of research studies can now occur.

As part of the agronomy programme, researchers evaluate new methods of production for white and coloured beans, soybeans for human and animal consumption, canola, winter rapeseed, and rutabagas. Various row widths, planting dates, crop rotations, and use of plowdown legumes are some of the practices studied. New varieties are tested for traits such as yield potential and

pesticide screening trials are held. These data are used in the process of selecting varieties and pesticides for registration and form the basis for Ministry production recommendations.

Studies on structural load characteristics of bottom-unloading tower silos and interior silo coating are being conducted by engineering personnel.

Centralia College has had educational programmes since 1967. Two-year diploma courses are offered in agriculture, food service, and animal health. In the fall of 1985, 289 full-time students registered; approximately 1450 people took part as well during the year in 52 short courses held both on and off campus.

PROJECT TITLE	RESEARCHER
FIELD CROPS	
Grain	
Evaluation of plowdown species in spring grain	Forrest
Weed control in corn	O'Toole
Protein and Oilseed	
Oil and protein crop variety trials	Forrest
White and kidney bean variety trials	Forrest
Effect of crop rotations on white bean yields	O'Toole
White and kidney bean management	Forrest, O'Toole
Weed control	O'Toole
Soybean management	Forrest
Canola management	Forrest
ECONOMICS	
A standard method, procedure and language for farm business analysis	Stephens
ENGINEERING	
Concrete tower silo coatings	Bellman
Pressures in bottom unloading tower silos	Bellman

ECONOMICS AND POLICY COORDINATION BRANCH

The Economics and Policy Coordination Branch is divided into three units: Policy Development, Policy Coordination, and Economic Information.

The Branch plays a central role in the overall functioning of the Ministry. Reporting directly to the Deputy Minister, it is responsible for developing, coordinating, and analyzing policy initiatives that affect the agriculture and food industry. At the request of the Minister and senior management officials, advisors assess the economic implications of policy alternatives. Important new and ongoing projects include the preparation of monthly newsletters on the latest data and on developments in the agricultural trade, and in the processing , distributing, and retailing (PDR), and farm input sectors.

Foreign agricultural policies and developments, as well as those in other parts of Canada, are monitored and analyzed to determine their effects on Ontario's industry. In particular, the effects of the countervailing duties assessed on hogs imported into the United States have been examined, and specific attention has been paid to the Food Security Act of 1985 and its amendments adopted in the United States. This legislation has the potential to affect the agricultural economies in countries all over the world. The implications of freer trade with the United States will dominate interests in the next year.

Staff members have also analyzed commodities and other matters of agricultural interest such as sugar, tripartite stabilization, agribonds, taxation, lambs, farm credit, and the financial health and status of the agricultural producers in Ontario.

The Policy Coordination unit in the Branch functions to guide the flow of legislation, regulations, and orders-in-council between the Ministry and central agencies with which the Ministry is in constant contact. It also schedules meetings and conferences for senior officials.

The Economic Information Unit monitors the efficiency of agricultural production by several means. Farmers are surveyed for inventory, yield, and price information, and the farm input sector is asked to supply current prices and future supply and price projections. Computer models on costs of production are maintained. Economists collate local information with international data to make commodity price and profitability forecasts on major commodities. Provincial agricultural statistics are published annually, and current domestic and international prices and commodity analysis is done on all major products available daily through the Farm Market News Service. This service distributes daily prices and market condition commentary by telephone to radio stations for broadcasting and directly to all others who wish such information.

A survey of custom farmwork rates charged in Ontario, 1986	Fisher	Farm rental arrangements in Ontario, 1986	Fisher, Campbell
Fruit crops, estimated production costs, Ontario, 1986	McKibbon	Asparagus production costs in Ontario	McKibbon, Fisher
Grain and forage crops, estimated production costs, Ontario, 1986	Fisher	Beef cow-calf computer model	Fearon
Vegetable crops, estimated production costs, Ontario, 1986	Fisher		

HORTICULTURAL RESEARCH INSTITUTE OF ONTARIO

The Horticultural Research Institute of Ontario is situated on some of Ontario's, and Canada's, prime horticultural land. This physical position allows its researchers to maintain close liason with the Province's fruit and vegetable industries and the programmes to be geared to specific requirements of those industries. HRIO is made up of four units: its headquarters at the Horticultural Experimental Station, Vineland, the Horticultural Products Laboratory also at Vineland, the Horticultural Experimental Station at Simcoe, and the Muck Research Station at Bradford north of Toronto. Although each specializes in certain areas, their programmes share the broad policy objective of import replacement by means of variety development, new storage and processing technologies, mechanized crop management, and energy conservation.

At the **HES, Vineland**, attention is focused on protected crops, tender and small fruits, tree fruits, and cross commodity studies in plant nutrition. Together with the nearby grape sub-station , Vineland occupies 90 hectares on soil that varies from ideal peach land to heavier clay soils. Specialists in protected crops, specifically greenhouse floriculture, vegetables, mushrooms, and ornamentals, are refining crop management and energy conservation methodologies to improve the economic viability of these industries. Research capabilities have been significantly enhanced with the major renovation of the greenhouse research facility in 1984. HRIO has the only publicly funded mushroom research facility in Canada. The ornamental programme has been redirected in 1985 to encompass more of the concerns of the commercial nursery industry. As with all HRIO programmes, individual projects are designed to reflect matters of importance to the industry.

The fruit research programme, shared with HES, Simcoe, is in the process of developing crop management technology and cultivars which will allow Ontario to produce more of the fresh and processed fruit required domestically. Grapes, plums, peaches, strawberries, raspberries, and blueberries are the main fruits targeted as 'import replacement' crops. The soil management programme, which involves studies in matters such as irrigation, mulching, and plant nutrients, has the aim of increased production and improved quality.

Breeding sweet and sour cherry varieties, including self-pollinating sweet lines, and Japanese and European plum varieties which will extend the season for domestic plum production is a central part of the tree-fruit programme. Other research looks at various rootstocks and planting densities which will improve yields in plums, cherries, and pears, and examines ways to reduce nutritional disorders in the trees. A budwood distribution service to nurseries and growers of virus-tested and non-virus-tested stock is maintained in conjunction with the Agriculture Canada Research Station, Vineland.

At the **Horticultural Products Laboratory**, Vineland, researchers are investigating storage, handling, processing, and quality of harvested fruits and vegetables. The evaluation of cultivars from HRIO's breeding programme and of those introduced from other regions is central to this work.

The storage research programme is designed to extend the marketable life of domestically produced vegetables and fruits. Traditional cold storage technology, high humidity filacell storage, controlled atmosphere, and ultra-low oxygen are some of the methods researchers are examining.

As with storage research, the goal of processing research, closely integrated with HRIO breeding programmes, is import replacement. Research into processing technology has priority; two examples are the development of a processing system for strawberries which will yield frozen products capable of competing with imported ones in quality and price, and of tomato paste products from domestically produced cultivars.

Ontario's vineyards occupy 34% of our fruitlands, and the crop constitutes 30% of the farm value of all commercial fruits. HPL's research provides a base for the Province's grape and wine industry, and much of the work is devoted to improving wine quality through the development of grape and wine standards. A surplus of wine grapes prompted the creation of a programme to develop new juice products, and studies on the use of grape pigment as natural food colourants are also underway. This latter should give growers an entry into world markets for the previously unused pigments.

Six resident research scientists now operate the programme at the **HES, Simcoe**, located near the north shore of Lake Erie. With one-third fruit and two-thirds vegetables, the programme reflects the commercial production in the area. One of the Station's mandates is to develop and/or refine the technology of new and existing crops which could be grown as alternatives to tobacco in the surrounding counties; the current depressed state of Ontario's tobacco industry makes this aspect of the HES's work most pertinent.

The Simcoe area produces about 25% of our apples. The Station maintains a substantial research programme to service that industry directed at overall orchard management and covering topics ranging from rootstock evaluation to the effect of growth regulators on vegetative growth and fruit yield. A new trial group of trees has been planted to study the water requirements of apples growing on coarse sandy soil representative of the tobacco area.

An extensive programme is underway to develop a complete production system for mechanically harvested strawberries for processing. Small fruit research is diversifying to include work on raspberries, currants, and some of the new hybrid berries from the UK such as tayberry.

Much of the vegetable research is directed at mechanical harvesting of crops grown in the central Erie counties especially for processing; these include tomatoes and pickling cucumbers. Field tomato breeding stresses the combination of superior horticultural qualities, disease resistance, and desirable processing characteristics. Genetic research in tomatoes is aimed at exploiting genetic techniques and germ plasm in unadapted cultivars and wild species.

The station maintains substantial programmes in potatoes (because of the possibility this crop could be grown as an alternative to tobacco), asparagus (Norfolk County now has two-thirds of Ontario's production), and herbicides. The vegetable weed control programme is the largest in Canada, and numerous commercial recommendations have resulted from that work.

Soil conservation is a crucial aspect of basic agricultural management, and the Simcoe Station has begun work on this in potato and tomato production.

Research on growing transplants in greenhouses is aimed at providing Ontario growers with the means to grow their own vegetable transplants instead of buying imports every spring from Georgia as is now commonly done.

"Muck" or organic soils form when plant materials decompose in water. The main crops grown in such soils in Ontario are onions, carrots, lettuce, celery, parsnips, cauliflower, broccoli, and cabbage.

The three-hectare **Muck Research Station at Bradford** assists local growers of these and other muck crops by means of seed testing, herbicide and fungicide screening, and storage studies. Emphasis is placed on finding disease and pest resistant cultivars and on setting cost-effective spray schedules where they are needed. The Station's crop management programme seeks to refine nutrient applications, determine optimum plant spacings, refine irrigation and water control technology, and generate information on how to protect soil from wind and water erosion. Soil management research is aimed at minimizing the subsidence of organic soils.

HORTICULTURAL CROPS

Fruit

PROJECT TITLE	RESEARCHER
Development of improved strawberry cultivars for fresh market and processing	Dale
Effect of cultural and harvesting practices on productivity, profitability and mechanization in strawberry production	Dale
Management in small fruit crops	Dale
Coordinated small fruit trials in Ontario	Dale
Effects of plant growth regulators on apple	Elfving
Effects of nitrogen fertilization on dwarf apple trees	Elfving
Irrigation of size-controlled apple trees	Elfving
Orchard factors influencing apple fruit quality	Elfving
Apple rootstock evaluation	Elfving
Apple cultivar evaluation	Elfving
Apricot breeding and cultivar evaluation	Fisher
Breeding for wine grapes adapted to Ontario conditions	Fisher
Grape breeding for dessert cultivars adapted to Ontario climatic conditions	Fisher
Grape rootstocks — Scion/rootstock combinations for non-vinifera cultivars	Fisher
Grape rootstocks for vinifera cultivars	Fisher
Grapevine population studies in relation to yield and quality	Fisher
Growth regulators in the vineyard	Fisher
Monitoring green De Chaunac harvest	Fisher
Soil management, irrigation and summer pruning interaction on Riesling/3309	Fisher
Summer pruning of vigorous grape cultivars	Fisher
Training systems for grape cultivars	Fisher
Vinifera cultivar and training interaction studies	Fisher
Breeding clingstone peaches	Miles
Breeding field resistance of peaches to canker disease	Miles
Chemical thinning of peaches	Miles
Evaluation of prunus rootstocks for peach	Miles
Peach cultivar evaluation for canker disease	Miles
Peach and nectarine cultivar evaluation	Miles
Peach orchard survey	Miles
Propagation methods for peach trees	Miles
Protected fruit cultures - apples	Miles
Protected fruit cultures - kiwifruit	Miles
Protected fruit cultures - peaches	Miles
Trellised peach orchard studies	Miles
The improvement of cranberry growing in Ontario	Smith
Breeding for early maturing European and Japanese plums and pollen compatibility studies with plums	Tehrani
Breeding for a seasonal succession of firm-fleshed non-cracking, self-fruitful, black sweet cherry cultivars and determination of incompatibility group of selections	Tehrani
Breeding sour cherry cultivars superior to Montmorency	Tehrani
Growth and productivity of Japanese plum cultivars on different rootstocks	Tehrani
Influence of Colt, Mahaleb and Mazzard rootstocks on the performance of Montmorency and Meteor tart cherries	Tehrani

Vegetables

PROJECT TITLE	RESEARCHER
Greenhouse vegetable crop management	Ingratta
Rockwood for greenhouse vegetable production	Ingratta
Vegetable cultivar trials	Ingratta
Alternative crops for tobacco farms	Loughton
Cole crop production and management	Loughton
Asparagus production and management	Loughton
Garlic production	Loughton
Potato management and physiology	McKeown

PROJECT TITLE	RESEARCHER
Tomato management and physiology	McKeown
Seed potato production and physiology	McKeown
Production practices for pickling cucumbers grown for mechanical and hand harvest	O'Sullivan
Influence of cultivars and other factors of production on yield and quality of peppers	O'Sullivan
Mushroom crop management - casing soil studies	Rinker
Mushroom crop management - response to supplementation	Rinker
Mushroom crop management - evaluation of pesticides	Rinker
Production of alternate fungi	Rinker
Cultivar Evaluation Trials	Valk
Crop protection trials (Cavity Spot in carrots)	Valk
Herbicide Trials	Valk
Crop management and fertility trials	Valk
Soil management trials (subsidence control)	Valk
Celery storage trials (post harvest, physiology and storage)	Valk
Ornamentals	
Climatic control systems for greenhouses	Blom
Commercial parameters for production of Anenomes in greenhouses	Blom
Comparison of double acrylic and single glass for greenhouse glazing	Blom
Development of Alstromeria as a greenhouse crop	Blom
Economic potential of Gypsophila in greenhouses	Blom
Evaluation of Cyclamen cultivars and container size	Blom
Evaluation of Easter lily production techniques	Blom
Evaluation of polyethylene films for greenhouse glazing	Blom
Evaluation of rooting media for Poinsettia cuttings	Blom
Factors influencing greenhouse Gerbera production	Blom
Factors influencing greenhouse Poinsettia production	Blom
Greenhouse roses on rockwool	Blom
Influence of soil cooling on greenhouse Freesia production	Blom
Nitrogen fertilization of greenhouse roses	Blom
Soil cooling requirements for greenhouse crops	Blom
Chemical protectants for roadside salt spray	Chong
Growing hardy roses in containers	Chong
Influence of growth substances on rooting of woody ornamentals	Chong
Ornamental plant evaluation	Chong
Rhododendron breeding	Chong
Rooting media for propagation of ornamental cuttings	Chong
Rooting studies in grow-bag containers	Chong
Soil amendments for containerized nursery crops	Chong
Soil and Water Management	
Evaluation and development of analytical methods for determining the nutrient staus of plant material	Cline/Reissmann
Fertilizer and soil management studies with apple	Cline/Reissmann
Fertilizer and soil management studies with grapes	Cline/Reissmann
Fertilizer and soil management studies with peach	Cline/Reissmann
Nitrogen and magnesium studies on plum	Cline/Reissmann
Replant studies with apple	Cline/Reissmann
Soil management for highbush blueberry production	Cline/Reissmann
Study of salt levels in Niagara vineyards	Cline/Reissmann
Suitability of papermill waste as a soil amendment	Cline/Reissmann
Trickle irrigation studies for horticultural crops	Cline/Reissmann
Pest Management and Disease Control	
The development of herbicide programs for various horticultural crops	O'Sullivan
Development of an ethylene measurement technique to determine apple harvest maturity	Chu
Development of a starch-iodine test guide for maturity evaluation of Ontario apples	Chu
Rootstock effects on harvest maturity of apples	Chu
Controlled atmosphere storage of apples	Chu

PROJECT TITLE	RESEARCHER
Low oxygen storage of apples	Chu
Studies on Daminozide effects on apple maturity and storage life	Chu
Studies on Paclobutrazol effects on apple maturity and storage life	Chu
Studies on controlled atmosphere storage of green bell peppers	Chu
Studies on cauliflower controlled atmosphere storage	Chu
Evaluation of new grape varieties for wine production	Edinger
Development of improved wine quality control methods	Edinger
Modification of white wine production	Edinger
Use of enzymes in wine production and analyses	Edinger
Occurrence and control of microbial metabolites in wine	Edinger
Development of a data base for wine grape standards	Edinger
Recovery of useful constituents from grape pomace and other fruit and vegetable processing plant waste material	Fuleki
Juice potential of commercial grape cultivars	Fuleki
Analysis of chemical and physical indexes of quality juice, wine and table grape cultivars and selections	Fuleki
Ultrafiltration and reverse osmosis in beverage technology	Fuleki
Development of HPLC based analytical methods for quality control in the food and beverage industry	Fuleki
Development of methods for measuring external and internal color of fruits, vegetables and their products	Fuleki
Color quality problems in horticultural crops and their products	Fuleki
Anthocyanin pigment composition of horticultural crops grown in Ontario	Fuleki
Evaluation of the sensory quality of fresh, stored and processed fruit and vegetable cultivars	Gray
Methodology of testing and training sensory evaluation panels	Gray
Development of appropriate methods for the sensory evaluation of fresh, stored and processed horticultural products	Gray
Operation and development of commercial wine standards	Gray

PROJECT TITLE	RESEARCHER
Storage facility operation and management	Lauro
Development of storage monitoring technology	Lauro
Energy aspects of storage	Lauro
Technical and economic evaluation of a mechanical strawberry harvesting system	Lauro
Automated environment monitoring	Lauro
Engineering aspects of food processing	Lauro
Storage studies on stone fruit	Smith
Storage studies on peaches for processing	Smith
Dessert grape storage studies	Smith
Storage studies on fresh strawberries	Smith
Storage studies on strawberries for processing	Smith
Asparagus storage studies	Smith
Celery storage studies	Smith
Crucifer crop storage studies	Smith
Processing quality studies on tomatoes	Wang
Quality monitoring techniques for processing tomatoes	Wang
Processing quality studies on peaches	Wang
Processing studies on stored peaches	Wang
Processing quality studies on small fruit	Wang
Processing studies on strawberries	Wang
Processing quality studies on apricots	Wang
Processing quality studies on bell peppers	Wang
Utilization of surplus and waste fruit and vegetable materials	Wang
Application of improved freezing methods on fruits and vegetables	Wang
Microbiological stability of horticutural food and beverage products	Chudyk
Effect of crop protection products on industrial microorganisms	Chudyk
Geographic analysis of grape quality in Ontario	Chudyk
Microbiology of fruit and vegetable storages	Chudyk

KEMPTVILLE COLLEGE OF AGRICULTURAL TECHNOLOGY

Eastern Ontario traditionally has been an area which specialized in livestock and forage crops. Recently, however, farmers have expanded their repertoire of crops to include ones such as soybeans and blueberries. This diversification has been stimulated to a great extent by research and demonstrations at KCAT. Cultivars have been selected which are tailor-made for the region and production recommendations developed for them.

The region has about 30% of the Province's dairy cattle and sells about $250 million worth of milk each year. KCAT's dairy research looks at all aspects of production in order to support this efficiency: calf nutrition and health, the development of diets for lactating dairy cows, and ways to improve the growth of replacement heifers. Work is also carried on in the heavy calf programme.

In response to many producers experiencing difficult times due to depressed markets and overproduction, KCAT is in the process of developing expertise in the area of market analysis. The objective is to study actively traded commodities and the opportunities which exist for the producer to ensure a market for those commodities. Beef and calf research will continue to concentrate on lowering production costs. Present work involves various techniques of protein supplementation and implant treatments.

Although corn continues to be the mainstay of field crops, research is making it possible for some area farmers to grow soybeans as an alternative livestock feed. KCAT agronomists provide Ontario's research committees with variety and management data from trials on corn, soybeans,. cereal, canola, and forages, and regional recommendations on soil management and weed control.

Kemptville recentlyn assumed a new task, to expand Eastern Ontario's horticultural industry. In the search for new crops, variety trials are held for various fruits and vegetables which may be commercially viable in that area. The promotion of local strawberries has already met with success. A greater supply of lowbush blueberry plants at the College, and further information on seedling lines, fertilizer requirements, and vegetable propogration should strengthen this fledgling industry. Maple syrup research at KCAT, which has the Province's only research bush, is aimed at improving syrup quality and conserving energy in syrup production.

Food Service and Technology projects support other research through quality assessment of fruit, vegetables, cereals, and maple syrup, utilizing textural and sensory analysis. Trials have been in progress to study the effects on meat quality of conditions both before and after the animal is slaughtered.

Kemptville College was founded in 1918 and occupies 325 hectares at Kemptville and 19 at Winchester. It offers both a two-year diploma programme and a wide range of continuing education courses to complement its research. In the fall of 1985, 252 full time diploma students registered and more than 1500 people registered in extension courses.

KCAT Business Management staff members have computerized the OMAF **Blue Book** utilizing a Lotus spread sheet. Income and expenses, accounts receivable, and accounts payable together with the farm bank account are all incorporated to provide the farmer with a monthly statement on both a cash and an accrual basis.

PROJECT TITLE	RESEARCHER
ANIMAL PRODUCTION	
Beef	
Fish meal and B vitamins for improved performance and reduced stress in newly arrived feedlot cattle	Hooper
A comparison of protein supplements in corn silage based diets fed to finishing steers	Hooper
Effects of two Ralgro levels on feedlot performance of finishing steers in Canada	Hooper
Improving the microbial and/or post-ruminal protein utilization of calves on Ground Ear LPS Diet-Phase II	Drevjany
The effect of supplementation with B vitamins and Aloe Vera juice on health and performance of calves	Wheeler
Dairy	
Influence of a lick block supplement on the growth of Holstein replacement heifers fed good or poor quality roughages	Wheeler
KCAT dairy herd progesterone assay	McEwen
Establishing the somatic cell count and mastitis incidence in the individual cows of the KCAT herd	Wheeler
Influence of dietary zinc methionine on somatic cell counts and mastitis incidence	Wheeler
Influence of a lick block supplement on performance of heifers on a community pasture	Wheeler
ENGINEERING	
Mole drainage and crop management	Cuthbertson
Manure gas detection Stage I	Clarke
Manure gas detection Stage II	Clarke
Natural corn drying in eastern Ontario	Plue
ECONOMICS	
Use of farm management tools by eastern Ontario farmers	Pickard
Use of farmer-owned computer farm management	Pickard
Pilot study of new entrants into the dairy industry in Dundas county	Morrison
Comparison of Economic production efficiencies of Ontario and New York state in the dairy industry	Morrison
Development of an electronic Blue Book	Morrison
Survey of graduate response to	Pickard

PROJECT TITLE	RESEARCHER
course content at Kemptville College in Agriculture	
Farm credit in Ontario	Morrison

FOOD AND FOOD QUALITY

New product development - Replacement of rice with hull-less oats	Johnson
Sensory and texture evaluation of small fruit crops (strawberries, blueberries, raspberries)	Johnson
Relationship of biochemical parameters to the tenderness of veal	Johnson
Sensory and texture evaluation for vegetable crops (potatoes, asparagus) and recipe development for specific potato varieties	Reasbeck
Recipe development - maple products	Reasbeck
Influence of storage conditions on apple quality	Johnson

FIELD CROPS

Grain

Cereal fertility project	Curnoe
Cereal variety project	Hoekstra
Cereal management project	Hoekstra
Cereal herbicide project	MacDonald
Corn fertility project	Curnoe
Corn variety project	Hoekstra
Corn management project	Hoekstra
Corn herbicide project	MacDonald

Forage

Forage fertility project	Curnoe
Forage herbicide project	MacDonald
Forage management project	Madill
Forage variety project	Madill

Protein & Oilseed

Oilseed fertility project	Curnoe
Oilseed herbicide project	MacDonald
Oilseed management project	Madill
Oilseed variety project	Madill

HORTICULTURAL CROPS

Fruit

Blueberry cultural practices	Ingratta
Small fruit variety trials	Ingratta
Tree fruit variety rootstock trials	Ingratta

Vegetables

Vegetable variety trials for Eastern Ontario a) Potatoes, early and late b) Cole crops, cauliflower and broccoli c) Tomatoes d) Sweet corn e) Asparagus	Langenberg
Vegetable management trial for Eastern Ontario a) Tomatoes: Nitrogen timing and rates b) Potato — Yukon Gold and 6535-7P c) Respond on cauliflower and tomatoes	Langenberg

Maple Syrup

Maple syrup production a) Energy conservation b) Quality control	Langenberg

NEW LISKEARD COLLEGE OF AGRICULTURAL TECHNOLOGY

New Liskeard College of Agricultural Technology based in Temiskaming District continues to address the regional needs of Northern Ontario agriculture. With around four thousand census farms scattered across over 80% of the Province, servicing the requirements of these farmers is always a challenge.

Agriculture in Northern Ontario, as in other areas of Canada, is going through a restructuring process. The major agricultural expansion which took place in the North during the late seventy's and early eighty's has been replaced by a consolidation period. Farmers are more concerned with debt repayment than with capital-extensive expansion. Increasing production efficiency is still an important farm objective; however, more attention is being directed to product marketing and farm business management.

NLCAT's agronomy research programme continues to develop regional recommendations for field and horticultural crops. More emphasis is being directed to developing new cropping alternatives for northern farmers who seek a more diversified range of cash crops as a method of reducing risk. Research with intensive cereal management and alfalfa seed production is more clearly defining the production parameters for this region.

A 4-hectare crop testing and demonstration site was established by NLCAT in the Rainy River district to provide much needed crop management data on which to base crop recommendations for Northwestern Ontario. This project, called CropCheck North, was funded under the AgriNorth development programme.

The SPUD unit at the College completed its second successful year of operation. This tissue culture lab has as its mandate to supply early-generation, disease-indexed potatoes for the Ontario seed potato industry.

NLCAT's livestock research includes projects in sheep, and dairy and beef cattle. A swine herd for teaching is maintained on campus as well. The main objective of this livestock programme continues to be development of feeding and management guidelines for the region's producers. The beef cow herd was relocated to a leased facility in closer proximity to the main campus. This

farm provides an opportunity for greater emphasis on beef cow-calf research. A ram pasture performance testing project was initiated in 1985 as was a four-year, stray voltage study with the dairy herd.

The Engineering section at the College initiated a modest research programme in the monitoring of barn ventilation systems and a farm survey into insulated tower silo construction.

A research and extension programme in agricultural marketing and farm financial management was started in 1985. This effort fills a void in Northern Ontario regarding farm business management.

The lack of optimism in agriculture today has had an impact on the College 2-year diploma enrolment. The number of full-time students slipped to 50 overall. Efforts in the continuing education area, however, have resulted in a significant increase in participation. Over 200 people enrolled in both off-campus and on-campus part-time studies. The continuing education courses were once again highlighted by the hands-on travelling agricultural computer course.

PROJECT TITLE	RESEARCHERS
ANIMAL PRODUCTION	
Beef	
Improvement of reproduction function in beef cows	Pollock
Sheep	
Estrus synchronization and artificial insemination in sheep	MacLaren
Comparison of performance of ewes fed a balanced vitamin-mineral enzyme to a conventional mineral supplement	MacLaren
The effects of allowing all ewe lambs to lamb once before culling on ewe productivity	MacLaren
Evaluation of using pasture to measure record of performance of rams	MacLaren
A study of growth and weight change patterns in suffolk ewes	MacLaren
March vs May lambing	MacLaren
Dairy	
Stray voltage effects on dairy cattle	Gumprich
Analysis of total performance and cost of Holstein bull calves raised for veal	Gumprich
FIELD CROPS	
Grain	
Weed control in cereals and other crops	Skepasts
Regional oat and barley tests	Skepasts
Intensive barley production	Skepasts
Nitrogen fertilization of barley on organic soils	Rowsell
Forage	
Silage corn performance test	Skepasts
Forage culitvar evaluation	Skepasts
Alfalfa seed production in northern Ontario	Skepasts
Protein and Oilseeds	
Cooperative field pea test	Skepasts
Oilseed crop cultivar evaluation	Skepasts
Nitrogen fertilization of canola in north eastern Ontario	Skepasts
Pasture	
Similated pasture management test	Skepasts
Species comparison of legume-grass mixtures for pastures	Skepasts
Miscellaneous Crop Testing	
Cultivar evaluation for crops adapted to north western Ontario	Skepasts
Horticultural Crops	
The effects of plastic mulch, support systems and direct seeding vs transplanting for vegetable crops	Hughes
The effects of plastic mulch on sweet corn production and yields	Hughes
Biennial cropping of raspberries	Hughes
Berry crop cultivar evaluation	Hughes
Flat row vs raised bed for strawberry production in northern Ontario	Hughes
Engineering	
Soil stabilization in heavy traffic areas	Garland
Swine barn natural ventilation system	Garland
Low temperature grain drying	Garland, Kirik
Silo insulation survey	Kirik
Veal calf barn porous ceiling ventilation	Garland, Kirik

RIDGETOWN COLLEGE OF AGRICULTURAL TECHNOLOGY

Southwestern Ontario is an agriculturally intensive region, home to one third of the Province's total agricultural production. It has the highest heat unit range in Canada, a favourable climate, and a broad selection of fertile soils. For over 60 years, research programmes have been conducted at Ridgetown — first as the Western Ontario Experimental Farm (1922), later as Ridgetown College of Agricultural Technology (1968) — programmes that have reflected and facilitated the growth of the agricultural industry in the Southwest.

The swine programme has long been the mainstay of livestock research at RCAT. Swine researchers seek to develop feeding and management strategies that will make for an efficient conversion of domestic feedstuffs into lean pork and to extend knowledge of swine nutrition and management to producers. The breeding herd of 20 sows supplies uniform crossbred market pigs for research purposes and exemplifies the benefits of proper herd management practices. Beef research is designed to optimize the dietary protein level in fast-growing, exotic, crossbred steers, to evaluate the efficiency of growth promotants, and to study cow fertility. Dairy research, although limited at this time, is assessing the effect of feeding and management techniques on the reproductive efficiency of dairy cows with superior milking ability. The 36 purebred Holsteins are the highest producing herd in Kent County.

As 60% of the region's farmland is planted to soybeans, corn, and winter wheat, it is essential that growers have access to superior field crop varieties and regional production guidelines. To provide these, cereal, perennial forage and grass legume, field bean, and soybean cultivars, as well as corn hybrids, are evaluated for licensing and monitored for recommendations in both on-and-off-campus trials. Their performances under a wide array of production techniques are monitored for recommendation purposes. Recently, a large soybean programme was established at RCAT with 4 testing sites.

The mandate of Ridgetown's horticultural programme is to develop production methods that will result in economical crop management. Research efforts include the testing of Ontario tomato and pepper breeding lines, cole crop studies, the development of plant establishment methodologies, and the evaluation of tender fruit cultivars for regional adaptability and hardiness. Fruit research continues to expand in step with grower interest, as seen in a new vineyard of vinifera grapes at Cedar Springs.

Agricultural engineering studies emphasize the modification of existing structures and operating procedures on area farms. Researchers are also working on drying and storage criteria for a low temperature corn drying system, summer cooling systems for swine barns, and the effects of various cultivation and tillage practices on energy requirements and water use.

RCAT's weed control programme seeks to improve systems to control the broadcast spectrum of weeds as economically as possible with reasonable crop safety and minimal disruption to the environment. The insects and diseases programme develops strategies for improved pesticide application systems, cultivar resistance, and the screening of candidate chemicals and adjurants to combat costly area pests such as the variegated cutworm and European corn borer.

The College's extensive soils research programme stresses the development and use of economically and ecologically sound soil management practices. Conservation studies include work with windbreaks and tillage practices to halt soil depletion caused by wind and monocropping. Maximum yield potential trials for corn and soybeans are underway in research plots, and comprehensive fertilizer application trials continue to generate guidelines for efficient use. RCAT chemists are pinpointing micronutrient deficiencies in Southwestern Ontario's crops to ensure growers make informed purchases of costly soil additives.

Farm economists at Ridgetown tailor their research to local needs by developing and refining financial and record keeping techniques so that they can be adopted readily by farmers. The use of computers is now an important part of their work.

RCAT's education programme grew out of the Western Ontario Agricultural School established in 1951. Today, the College offers 2-year diplomas, with an increasing number of specialized courses to meet present and future needs of the region's ever more sophisticated and diversified agribusiness. In 1985, 320 full-time students were enrolled. Extension programmes attracted over 7000 people and included management of farm business courses, commodity days, seminars, and Farmers' Week.

PROJECT TITLE	RESEARCHER
ANIMAL PRODUCTION	
Beef	
Development of intensive management programs for beef cows	Vander Wielen
Growth rate and feed efficiency improvers for feedlot cattle	Vander Wielen
Dairy	
Feeding program for lactating cows	Vander Wielen
Swine	
Feeding programs for growing pigs	Morris
Management systems for swine	Morris
Swine structures and environment	Morris
Specific swine industry problems	Morris
FIELD CROPS	
Grain	
Tissue analysis for nutrient content as affected by various fertilizer practices	Brimner, Johnston
Calcium and magnesium in crop production from the use of agricultural limestone	Johnston
Micronutrients in field crops — yield and nutrient composition practices — zinc, manganese, copper, boron	Johnston
Cereal varieties and management	Smid
Hybrid evaluation for grain and forage	McLaren
Production studies in grain corn	McLaren
Forage	
Forage varieties and management	McLaren
Alfalfa seed production using leafcutter bees	Taylor
Protein and Oilseed	
Evaluation of soybean cultivars	Ablett
Cultural studies in soybeans	Ablett
Evaluation of field bean types and cultivars	Ablett
Cultural studies in field beans	Albett
Evaluation of chickpeas, pigeon peas and black gram as potential crops in Ontario	Ablett
HORTICULTURAL CROPS	
Fruit	
Performance and hardiness testing of tender fruit, grapes, and apple varieties in Kent County	Muehmer

PROJECT TITLE	RESEARCHER
Vegetable	
Cultural and management studies in processing tomatoes under Southwestern Ontario conditions	Muehmer, Morton
Breeding, cultivar testing and management studies with processing peppers	Muehmer
Cultivar testing and management studies of various vegetable crops in greenhouses	Muehmer
Cultivar testing and management studies with cole crops and other small acreage crops	Muehmer
Cultivar testing and evaluation of processing and greenhouse tomatoes	Muehmer
SOIL AND WATER MANAGEMENT	
Maximum yield research with soybeans	Stevenson
Soil test calibration — field beans	Baldwin
Tillage and fertility studies on corn	D. Young
Nitrogen research with corn under conservation tillage	Stevenson
Corn, legume, and grass interseeding	Nanni
Shelterbelt protection and potato and tomato growth and yield	Baldwin
Phosphorous and potassium soil test calibration research with soybeans	Stevenson
Nitrogen research with winter wheat	Stevenson
Maximum yield research with corn	Stevenson
WASTE MANAGEMENT	
Composted sewage sludge on corn and soybeans	Baldwin
PEST MANAGEMENT AND DISEASE CONTROL	
Effect of hebicides on weed control and crop response in beans	Swanton
Effect of herbicides on weed control and crop response on cereals and alfalfa	Swanton
Herbicides for control of specific weeds	Swanton
Effect of herbicides on weed control and corn yield with and without weed escapes	Brown
Effect of herbicides on weed control and crop response in vegetable crops, transplanted and field seeded tomatoes, peppers, asparagus and red beets	Brown
Studies in the control and biology of velvetleaf (abution threophrasti) and quackgrass	Brown
Effect of herbicides on weed control and crop response in vegetable crops	Swanton
Soil insect control in field corn	Pitblado
Insect control in horticultural crops	Pitblado
Foliar insect control in field crops	Pitblado
Pesticide application techniques in horticultural crops	Pitblado
Seedling decay and root rots in field crops	Morton
Foliar disease control in field crops	Morton, Pitblado
Disease control in horticultural crops	Pitblado
Insect and disease control in field tomatoes	Pitblado
ECONOMICS	
Weed losses study	Beattie
Farm financial management	Beattie
Analysis of farm production systems	Beattie
Analysis of marketing strategies for Ontario producers of corn and soybeans	Doidge
Potential for computer use on the farm	Ross
ENGINEERING	
Monitoring energy efficiency of low temperature drying	Underwood
Damage to plastic drains with wheel trencher	Sojak
Cooling of ventilation air	Sojak

UNIVERSITY OF GUELPH

For over a century, the Ontario Agricultural College, the Ontario Veterinary College, and more recently, the other Colleges of the University of Guelph, have run research programmes on behalf of the Ontario Ministry of Agriculture and Food. The nature of these programs has changed considerably over the years and the scope has broadened dramatically. New disciplines such as environmental biology, plant and animal biotechnology, and energy management have been introduced to complement the traditional ones such as animal husbandry and horticulture. In the early years, research and demonstration trials were held on what is now the University campus. Now, much of this work has moved to the six experimental farms owned by the Ministry and run,

under contract, by the University: Arkell (swine, poultry, engineering, environmental biology), Cambridge (horticultural crops, turf management, pest management), Elora (beef, dairy, field crops, soils), Guelph (feed production), Ponsonby (animal health), and Woodstock (field crops). The main areas emphasized in each of Guelph's research programmes are listed below followed by the titles of the current projects within each programme.

The Ontario Agricultural College has offered diploma programmes funded by the Ministry since 1874. In the fall of 1984, 357 students registered in these. Diploma courses are offered as well through the Independent Study programme, the only one of its kind in Canada. Last year, over 4000 students took part in these courses. Extension courses are held throughout the year in the form of workshops, symposia, and conferences; many are annual events such as the Poultry Industry and Bankers Schools while some are one-time courses, for example, canola production or meat processing for inspectors.

ANIMAL PRODUCTION

Beef

With the marketing conditions at present, beef operations must be run as efficiently and with as few losses to disease as possible. Research at Guelph emphasizes the development of breeding, feeding, and general management practices which will achieve this goal of efficient production by allowing producers a choice of systems best suited to their long-term needs. For the immediate problems livestock farmers encounter, researchers are attempting to pinpoint the nutrient requirements of feedlot cattle more closely, examining the usefulness of growth implants and feed additives, and studying ways to enhance the value of forage based feeds. Work is also in progress on the genetic base for feed efficiency in cows.

To improve the health of highly productive livestock, veterinary scientists are evaluating the stresses of modern husbandry as well as programmes of preventive medicine using vaccines and new epidemiological techniques for monitoring herd calves born and weaned. Respiratory diseases in feedlot cattle continue to be a serious problem which research into housing and other management practices is attempting to alleviate.

PROJECT TITLE	RESEARCHER
Degradation of cellulose and the conversion of cellulosic wastes to feeds by mixed cultures of microorganisms	Smith
Corn silage studies: Value of nitrogenous additives and agronomic and ensiling consideration that affect nutritive value	Buchanan-Smith
The role of carcass composition on meat quality in beef cattle	Buchanan-Smith, Jones, Wilton, Gullett
Improving beef cattle testing programs	Schaeffer, Wilton
Effect of breed and plane of nutrition on calf performance and reproduction in the cow	King, MacLeod, Wilton
Pasture systems	MacLeod, Winch
Growth promotants for livestock	Burgess, Etches, Jones
The effect of feedlot reception procedures on feeder calf performance	Buchanan-Smith, Burgess, Curtis
Characteristics of donors and recipients influencing the efficiency of beef production through embryo transfer	Wilton
Grain mycotoxins in diets of ruminants	Grieve, Moran, Young, Lumsden, Valli
The effect of nutrition on the acute pulmonary edema and emphysema induced by 3-methylindole	Bray
Effect of salinomycin on performance of feedlot cattle	MacLeod
Interaction of forages in rumen digestion	Buchanan-Smith, MacLeod, Mowat, Forsberg

PROJECT TITLE	RESEARCHER
Protein requirements of large-framed growthy feedlot cattle	Buchanan-Smith, MacLeod
Determination of genetic differences in feed conversion rates for beef cows and feedlot cattle	Wilton
Factors affecting fertility of beef cows	Mowat
Solid-state 13C(CP-MAS) NMR spectroscopy of forages	McBride
Relationship between protein synthesis and NA+/K+- transport in ruminant tissues	McBride
Microscopic and endocrinological investigation of material/conceptus interactions during gestation	King
Separation and utilization of whole plant corn silage	Mowat
Development of a test for the diagnosis of early pregnancy in cows	Walton
Breed X casteration interactions in the feedlot	Burgess, Jones Wilton
Feeding frequency on the utilization of high roughage diets	Mowat
Alfalfa silage for growing weaned calves	Buchanan-Smith, Mowat
Pathogenesis of mycotoxins in domestic animals	Gentry
Bronchopulmonary exfoliated cells in the diagnosis of bovine repiratory diseases	Sanderson, Singh
Reproductive problems in twin bulls produced by embryo transfer techniques	Basrur
Testing for tetracycline in milk and meat following ingestion of	Leslie, Luescher, Black

PROJECT TITLE	RESEARCHER
experimental rabies vaccine baits	
The pathogenicity of H. somnus in the bovine respiratory tract	Little, Barnum, Thorsen
The transfer of immunoglobulins in association with placental pathology in cattle and sheep	Miller
Development of bovine lung organ culture techniques to study pathogenesis of bovine pasteurellosis	Yager
The immunology of bovine occular squamous carcinoma	Stirtzinger, Valli, Baird, Livesey, Shewen
Relationship of elevated creative phosphokinase levels to mortality in sick cattle admitted to OVC	Lumsden, McSherry, Valli
Leptospiral abortion in cattle in Ontario	Miller, Prescott
The effects of ureplasma diversum on bovine embryos: in vitro studies	Miller
The association between physiologic status, immune response and respiratory disease in feedlot cattle	Lumsden, Rosendal, Martin, Meek Shewan
The immunopathogenesis of infection with bovine leukemia virus	Valli
Host resistance to pasteurella haemolytica	Shewen, Wilkie
Improved methods for the detection of viruses in bovine semen	Thorsen
Bovine respiratory disease — an evaluation of therapy	Bateman, Menzies, Martin, Shewen
BENCH-MARK: a project to identify and improve the health and productivity of Ontario beef cow-calf herds	Martin, Meek
Rapid detection of viruses from infected animals using ELISA and monoclonal antibodies	Thorsen
Research into the clinical application of the use of xylazine reversing agents	Curtis, Etherington, Leslie, Bateman, Pascoe, Sandals
Biochemical and clinical evaluation of oral electrolyte formulations in neonatal calf diarrhea	Baird, Gyles
Bovine parvovirus infection: prevalence and other aspects of its epidemiology	Sandals, Meek
Pathogenesis and immunology of bovine parovirus infection	Sandals

Dairy

Ontario's dairy cattle are among the best in the world; nevertheless, our dairy farmers will remain competitive only through greater productivity, both biological and economic. Research priority is given to finding more accurate procedures for identifying superior genetic stock, to developing feeding systems which will supply high producing cows with their increasing nutrient requirements, and to improving reproductive efficiency.

With the needs of larger dairy farms in mind, researchers are developing efficient, computerized health-maintenance records. Work continues in chronic problem areas such as diarrhea in young calves, respiratory diseases, and infectious diseases which impair performance. Therapeutic and prophylactic measures are under study against a wide range of such conditions.

Nutritive value of alfalfa silage	Buchanan-Smith
Measurement of estrone sulphate in milk as a method for early confirmation of pregnancy in cows	Friendship, Leslie, Sandals, Raeside
Relationship between external rump measurements and calving difficulties in Canadian dairy cattle	Burnside, Schaeffer
Development of an automated system of measuring milking speed in dairy cows	Burnside, Schaeffer
Comparison of several linear models for use in dairy cattle sire evaluation	Kennedy, Schaeffer
Evaluation of Holstein Friesian A1 sires for stillbirths, ease of calving, conformation, temperament and other auxiliary traits	Burnside, Schaeffer
The relationship between the motor activity and production of dairy cows	Hurnik
The effects of plant and fish protein in preruminant calf diets on growth, health and immunological parameters	Burton
Interrelationships of dietary and digestive factors of ruminants	Burton, MacLeod, Young, Grovum
Grain mycotoxins in diets of ruminants	Grieve, Moran, Young, Lumsden, Valli
Influence of prepartum feeding and body condition on feed intake, milk production and health in early lactation	Grieve, MacLeod, Lumsden, Curtis
Genetic and environmental causes of immunoglobulin levels in Canadian dairy cattle	Burnside, Burton, Wilkie
The role of estrogenic compounds in the etiology of milk fever	Bray, Draper
The role of B-Carotene in the fertility of dairy cattle maintained in a confined environment	Buchanan-Smith, Walton, Stone
Effect of ration protein degradability on lactation response	Buchanan-Smith, Grieve, MacLeod

PROJECT TITLE	RESEARCHER
Effect of sodium hydroxide treatment of protein on digestion	Buchanan-Smith, MacLeod
Blended complete diets for dairy cattle in conventional housing	Grieve, McMillan, Stone
Evaluation of milk quality and quantity using SCP from Roslyn Park Farms on five milking cows in Elora	Buchanan-Smith
A comparison of structural and functional aspects of normal and early cystic bovine follicles	King, Walton
Maintenance of early pregnancy in cattle	King, Walton, Leslie, Raeside
Comparison of dairy cows of high genetic merit for production with varying size	McBride, Burnside, Burton, MacLeod
Prediction of udder health staus in dairy cows based on the somatic cell count of the milk	Allen, Meek
Development of a test for the diagnosis of early pregnancy in cows	Walton
Efficacy of recombinant growth hormone (RBGH) for lactating cows	McBride, Burton, MacLeod, McMillan, Bateman
Consequences of fibre upon digestive function and productivity of lactating cows fed silage based diets	Allen, Buchanan-Smith, MacLeod, Zelin, Grovum
Estrous synchronization in dairy heifers: comparison of pregnancy rates at timed insemination with cloprostenol or norgestomet	Grieve, Bateman, Menzies
The sensitivity and specificity of cowside milk progesterone tests	Walton, Etherington, Leslie, Research Associate
Feeding stategies to enhance rumen function and productivity of dairy cows	Buchanan-Smith, Grieve, MacLeod
Growth rates, composition and performance of dairy replacement heifers	McBride, Grieve, MacLeod
Influence of prepartum feeding and body condition on feed intake, milk production and health in early lactation	Burton, Grieve, MacLeod
Canola meal as a protein supplement in corn-based dairy rations	Buchanan-Smith, Grieve, MacLeod
3-Methylindole—induced pulmonary edema and metabolic basis of prolonged pulmonary disease in ruminants	Atwal
Pharmacological studies of hypersensitivity, inflammation and associated homeostatic mechanisms in domestic ruminants	Eyre
An investigation into the nature, prevalence and significance of congenital factor XI deficiency in cattle	Gentry
Tissue residues in normal and diseased animals following chloramphenicol treatment	Black, Eyre, Barnum
Measurement of estrone sulphate in milk as a method for early confirmation of pregnancy in cows	Friendship, Leslie, Sandals, Raeside
Brown adipose tissue: a physiological and morphological study	Harris, Yamashiro
Study of the effect of fatty liver on drug and toxin biotransformation in dairy cows	Black, Boermans
Study of pulsatile release of prostaglandin F2 (PGF2) in the cyclic cow	Liptrap
Reproductive problems in twin bulls produced by embryo transfer techniques	Basrur
The relationship of postaglandin admininstration, histological and bacteriological results of endometrial biopsy and rectal palpation	Miller, Etherington, Johnston, Savage, Liptrap, Gannon, Martin
Single dose pharmacokinetic study of antibiotic penetration into the CSF and synovial fluid of normal calves	Horney, Staempfli, Black
Testing for tetracycline in milk and meat following ingestion of experimental rabies vaccine baits	Leslie, Luescher, Black
Experimental oncology	Valli
The transfer of immunoglobulins in association with placental pathology in cattle and sheep	Miller
Development of bovine lung organ culture techniques to study pathogenesis of bovine pasteurellosis	Yager
The immunology of bovine occular squamous carcinoma	Stirtzinger, Valli Baird, Livesey, Shewen
Evaluation of serum gamma-glutamyl transferase as an indicator of colostrum intake in newborn calves	Lumsden, Baird, Johnson
Relationship of elevated creatine phosphokinase levels to mortality in sick cattle admitted to OVC	Lumsden, McSherry, Valli
Leptospiral abortion in cattle in Ontario	Miller, Prescott
The effects of ureplasma diversum on bovine embryos: in vitro studies	Miller
The immunopathogenesis of infection with bovine leukemia virus	Valli
Ureaplasma diversum as a cause of infertility in cattle	Miller
A study of the prevalence of staph. aureus and other staphylococci as	Leslie, Bateman, Barnum

PROJECT TITLE	RESEARCHER
causative agents in chronic bovine mastitis	
An investigation of salmonella muenster outbreaks in dairy herds in southern Ontario	Barnum, Gannon
Improved methods for the detection of viruses in bovine semen	Thorsen
An animal health surveillance system: a pilot study	Etherington, Menzies, Meek
Bovine respiratory disease — an evaluation of therapy	Bateman, Menzies, Martin, Shewen
Relationship between milk immunoglobulin concentrations in early lactation and the incidence of mastitis in current and future lactations	Leslie, Barnum, Muckle, Johnston
Prediction of udder health status in dairy cows based on the somatic cell count of the milk	Allen, Meek
Development of a vaccine against salmonella typhimurium in cattle	Butler, Gyles
Bovine viral diarrhea/mucosal disease: a study of prevalence and biological activity of the causal virus in infected herds	Baird, Thorsen
Rapid detection of viruses from infected animals using ELISA and monoclonal antibodies	Thorsen
A study of the occurence, characteristics and significance of L-form variants of staphylococcus aureus in bovine mastitis	Muckle, Leslie, Menzies
Influence of prepartum feeding and body condition on feed intake, milk production and health in early lactation	Grieve, MacLeod, Lumsden, Curtis
Research into the clinical application of the use of xylazine reversing agents	Curtis, Etherington, Leslie, Bateman, Pascoe, Sandals
Biochemical and clinical evaluation of oral electrolyte formulations in neonatal calf diarrhea	Baird, Gyles
Efficacy of a piliated moraxella bovis bacterin in the control and prevention of IBK under field conditions	Leslie, Bateman
Bovine parvovirus infection: prevalence and other aspects of its epidemiology	Sandals, Meek
The lower respiratory tract of normal calves: their normal free cell population, their immunoglobulins, viral and bacterial inhabitants	Valli, Willoughby, Viel, Martin, Shewen
Pathogenesis and immunology of bovine parovirus infection	Sandals
An investigation of the heritability of atresia coli in calves	Ducharme, Horney, Johnson
Effects of idazoxan on behavioural and cardiorespiratory parameters in laterally recumbent xylazine treated calves	Pascoe
Estrous synchronization in dairy heifers: comparison of pregnancy rates at timed insemination with cloprostenol or norgestomet	Grieve, Bateman, Menzies
The sensitivity and specificity of cowside milk progesterone tests	Watson, Etherington, Leslie, Research Associate

SWINE

The high quality of Ontario pork is recognized around the world and exports of breeding stock and pork products contribute significantly to Canada's balance of trade. Production efficiency must continue to improve, however, if hog producers are to get a fair return, the public is to have high quality products, and export markets are to expand. Scientists are studying ways to improve efficiency in reproduction, utilization of feed, genetic evaluation programmes, and carcass quality. They are also noting and regulating environmental factors that affect the well-being of the pigs. Basic research is underway on muscle biology and its effects on meat quality, on the main nutritional needs of piglets, and on the dynamics of pig populations with genetic selection.

In recent years, herd health has been emphasized. A comprehensive project is nearing completion which charts the relationship of management practices and drugs to productivity and includes computerized monitoring of management practices and swine health.

Ingestive behaviour of neonatal piglets	Morrison, Hurnik
Triticale in diet of pigs	Young
Grain mycotoxins in diets of pigs	King, Moran, Walton, Young, Lumsden, Valli
Causes, detection and amelioration of meat, with abnormally high or low PH	Swatland
The effect of environment on the absorption of immunoglobulins by the newborn piglet	Hacker
Nutrition and management of pigs for reproduction	King, Walton, Young
Evaluation of floor type and pig density	Ogilvie
Energy metabolism in young pigs	Bayley
Use of rapeseed (Canola) meal in baby pig diets	Bayley
Conditioned interval feeding in swine	Hurnik
The effect of leanness on the quality and processing attributes of pork	Jones, Kennedy, Gullett
Evaluation of methane fermentation residue in diets of pigs	Young
Initiation of pregnancy in pigs	King

PROJECT TITLE	RESEARCHER
Circadian rhythms of hormones in lactating sows	Hacker
Different systems to handle manure from slatted floor barns	Hacker
Porcine embryo culture	King, Johnson, Yamashiro
Determination of factors affecting effective environmental temperature for the young pig	Morrison
Effect of dietary amino acids on polyamine metabolism in swine	Smith
Treatment of T-2 toxicoses by supplemental dietary amino acids	Smith
Genetic improvement of swine on a population basis	Kennedy
Correlative uterine microscopy and plasma steroid levels in lactating sows and sows with experimentally induced cystic ovaries	Geissinger
Detection of carrier state of porcine stress syndrome (PSS)	Basrur
Interrelationship of progesterone and prostaglandin F20 in the metritis-mastitis-agalactia (MMA) syndrome in post-parturient sows	Liptrap
Steroid biosynthesis in the testes of of the boar	Raeside
Brown adipose tissue: a physiological and morphological study	Harris, Yamashiro
Pathogenesis of mycotoxins in domestic animals	Gentry
Direct action of glucocortico-steroids on the ovary in the pig	Raeside
Analysis of the interesex syndrome(s) in swine	Fisher, Partlow
Glucocorticoid influence on ovarian follicular development in the sow	Liptrap
Porcine embryo culture	King, Johnson, Yamashiro
Assessment of innunocompetent cells within the pregnant uterus	Croy
Histochemical and morphometric studies on stress-susceptible pigs	Hulland
The influence of cold stress on the severity of porcine neonatal colibacillosis	Wilcock
Salmonellosis in swine	Wilcock
Pleuopneumonia of pigs caused by haemophilus pleuropneumoniae	Rosendal
Response of young pigs to immunization against common swine pathogens	Miniats, Rosendal
Stimulation of NK cell activity in the newborn piglet	Derbyshire
Genetic control of immune response and disease resistance in pigs	Wilkie
An evaluation of a computer system for collection and analysis of hogkill data	Mitchell
Molecular analysis of porcine haemophilus spp	Rosendal, MacInnes
The role of escherichia coli cytotoxin in post-weaning diarrhea and edema disease of swine	Gyles
Heuristic swine production and management model	Pfeiffer, Friendship, Wilson
A survey of drug use on Ontario swine farms	Hacker, McMillan, Friendship, Wilson
Intestinal disorders: pathogenesis of acute viral diarrhea using T.G.E. of piglets as a model: intestinal glucose transport	Butler
Methods to decrease fighting in groups of dry sows	Friendship, McKeown, Luescher
Eperythrozoa and stillbirth relationship in swine	Friendship, Wilson
Leg weakness affecting breeding-age swine: an observational study	Friendship, Wilson
Development of an enzyme-linked immunosorbent assay (ELISA) for the diagnosis of transmissible gastroenteritis (TGE) in swine	Derbyshire

POULTRY

The goal of the poultry programme is to refine the technologies used at present in our meat and egg industries. Since items such as deboned chicken and broilers already cut up have become popular, researchers are studying the nutritional and genetic factors involved in carcass composition of broiler chickens and turkeys. Studies on sexual development in Leghorn and broiler breeders aim at defining optimum environments to control pullet development. At the same time, bird welfare is being examined through behavioural and environmental studies. Basic research allows scientists to understand better the avian system, how ovulation is affected by hormonal and photoperiod rates, and the nutritional needs of all types of poultry.

Research into poultry health looks to reduce or eliminate the incidence and severity of those infectious and uninfectious diseases which have the greatest effect on productivity and profitability; control of zoonotic disease is also of concern.

Efficacy of antibiotics, growth promotants and coccidiostats for poultry	Leeson	Protein evaluation	Summers
Nutrient requirements of growing pullets and laying hens	Summers	The control of ovulation in domestic birds	Etches
		Significance of finish on the turkey carcass to its cooking characteristics and yields	Moran

PROJECT TITLE	RESEARCHER
Factors influencing the hatchability of eggs from commerical sources	Moran, Reinhart
Factors affecting feed efficiency in the laying hen	Morrison
Studies on lameness and leg problems in broiler chickens and turkeys	Friars, Leeson, Summers, Julian
Poultry egg production curves	McMillan
Behaviour of hens in battery cages	Hurnik
Right ventricular failure and ascites in broiler and roaster chickens	Julian
Development of feeding systems for poultry	Leeson
Tissue residues in normal and diseased animals following chloramphenicol treatment	Black, Eyre, Barnum
Combined toxicity of mercury, lead and cadmium in domestic ducks	Bhatnager
Host-parasite interaction in the coccidiapathogenetic mechanisms involved in the disease caused by coccidial parasites	Fernando
Studies on lameness and leg problems in broiler chickens and turkeys	Friars, Leeson, Summers, Julian

PROJECT TITLE	RESEARCHER
Development of monitoring procedures for the early detection, and prevention of dissemination of salmonella and other poultry diseases	Epps
Investigation to determine the cause of sudden death syndrome in broiler chickens	Julian, Hunter
Biochemical analysis of the serum of leghorn layer flocks: comparison of normal flocks and those with poor egg or shell quality	Julian, Hunter
Right ventricular failure and ascites in broiler and roaster chickens	Julian
The pathogenesis of and immune response to paramyxovirus-3 infection of turkeys	Thorsen
Experimental infection of turkeys with infectious bursal disease and hemorrhagic enteritis viruses	Thorsen
Studies of mycoplasma iowae in turkeys	Miniats, Rosendal
Relationship of plasmids to virulence in avian salmonellae	Gyles

SHEEP AND GOATS

Research at Guelph is concerned chiefly with identifying and controlling economically significant diseases and increasing reproductive performance in the Province's sheep and goat industries. Thus far, items of central importance are control of enterotoxemia (type D), caseous lymphadenitis, parasitic infections in both species, respiratory infections in goats, improved pregnancy diagnostic systems, artificial insemination, and embryo technology.

PROJECT TITLE	RESEARCHER
The control of food intake and gastro-intestinal functions in sheep — a model ruminant	Grovum, Chapman
Metabolic and morphologic basis of pulmonary alveolar-capillary permeability and detoxification of metabolites	Atwal
Brown adipose tissue: a physiological and morphological study	Harris, Yamashiro
Interaction of parasitic and microbiological agents in pneumonia of goats and sheep	McCraw, Rosendal
The transfer of immunoglobulins in association with placental pathology in cattle and sheep	Miller
Control of lungworm muellerius capillaris in dairy goats by strategic anthelmintic treatment and herd management	McCraw, Menzies
Natural bone disease in sheep	Hulland
The immunopathogenesis of infection with bovine leukemia virus	Valli

PROJECT TITLE	RESEARCHER
Studies on the pathogenesis of the disease in goats caused by mycoplasma mycoides subsp. mycoides	Rosendal
A. Studies of the pathogencity of corynebacterium pseudotuberculosis	Muckle
B. Detection of corynebact. pseudo T.B. antigens by immunoblotting	
Laparoscopic embryo transfer in sheep	Johnson, Buckrell
Development of a coxiella ELISA for an epizootiological study of Q fever infection in Ontario goat and sheep flocks	Lang
Control of caseous lymphadeniis in a commercial diary goat herd	Menzies, Muckle
Control of lungworm muellerius capillaris in sheep	Johnson, Buckrell
Embryo micromanipulation	Johnson, Buckrell
Embryo transfer and superovulation in sheep	Johnson, Buckrell

HORSES

The horse industry is a major one in Ontario and a very important employer. At the University of Guelph, the equine research programmes were consolidated in 1984-85 with the development of the Guelph Centre for Equine Research, a reflection of the industry's significance and of the growing financial commitment from the private sector. The research will continue to reflect the main problems encountered in raising and using horses for a variety of activities: respiratory and cardiac disorders, reproductive disorders, and growth development, and performance problems.

PROJECT TITLE	RESEARCHER
The isolation, identification and synthesis of estrous pheromone in the mare	Teal, McKeown, Savage, Luescher
Leptospiral abortion in horses	Prescott
The anthelmintic control of strongyles and tapeworms in horses	Slocombe
Genetic improvement of the Canadian Hunter for height, conformation and development	Burnside
Restoration of abduction of paralyzed equine arytenoid cartilage (phase 2)	Hulland, Ducharme, Horney, Partlow
A pharmacological study of the equine hoof in relation to the etiology and therapy of laminitis	Eyre
Clinical research in equine joint disease	Hurtig
Early detection of acquired coagulation abnormalities in horses with gastrointestinal disease (colic)	Johnstone
Microvascular free skin flaps in the horse	Horney, Hurtig, Miller
The development of ultrasound techniques in the clinical horse	O'Grady
A collaborative prospective study of equine post-operative lameness	Pascoe, Dyson
Purification of protective antigens of corynebacterium equi	Prescott
Endocrinology of gestation in the mare	Savage, Raeside
The effect of femprostalene on ovulation control and subsequent luteal development in the mare	Savage, Liptrap
Maximizing 'cushion effects' of dirt racing surfaces for thoroughbred racing	Sheard
Significance of equine influenza A-1 and A-2 viral infection on the pathogenesis of chronic small airway disease in the light horse	Valli, Willoughby, Viel, Thorsen
Stress testing for diagnosis and prognosis purposes in horses with early signs of respiratory dysfunction	Wilson, McDonell, Willoughby
A study of inflammation in the horse using a skin model	Wilcock, Yager, Baird, Eyre
Evaluation of systemic effects of topically applied atropine in the horse	Pascoe, O'Grady, Williams
The pathogenesis and prevention of corynebacterium equi pneumonia	Yager
Study of lavage and biopsies for diagnosis of respiratory diseases	Eyre, Yamashiro
The role of the fetus in the hormonal regulation of gestation in the horse	Raeside
Corynebacterium equi infections in foals	Yager, Prescott
Strongylids in equine: biology, pathogenesis and control. I. strongylus vulgaris	Slocombe, McCraw
Seasonal deworming of mares to control strongyle parasites	Slocombe
Campylobacter jejuni infections	Prescott
Simultaneous assessment of heart and respiratory rates and gait in racing, performance and working horses	Willoughby
Assessment of cardiac function in the horse showing limited exercise tolerance utilizing vectorcardiology and computer analyses	Physick-Sheard

BEES

Honeybee research concentrates on increasing honey production by improving both bees and nectar sources. Selection, breeding, and evaluation is yielding bees with characteristics such as the ability to collect nectar and pollen at colder than normal temperatures early in the day or in the season and, therefore, which perform better than others under Ontario conditions. Selections of alfalfa and rapeseed are being screened for high nectar production. These will be used as the basis for new varieties which will secrete more nectar, attract larger numbers of pollinators, and thereby improve pollination and seed yields. The long-term effects on bee colonies exposed to sublethal amounts of insecticides are also under investigation.

Physiological indices of nectar potential in forage legumes	Shuel
Selection of honey bee strains for improved foraging under Ontario conditions	Smith, Milne
Secretion of systemic insecticides in nectar and their effect on honybee colonies	Shuel
Selection for high nectar potential in some agricultural honey plants	Shuel
Introduction of insecticide resistance genes into beneficial insects	Phillips, Krell

FISH

Guelph's fish reasearch programme supports work on the nutritional needs and disease susceptibility of fish raised in captivity, particularly rainbow trout. It's objective is to boost the productivity and profit margins for Ontario's commercial trout farms. Basic nutritional needs and how environmental conditions affect these are under study with applied research looking at the formulation and processing of cost-efficient commercial diets. Fish diseases are monitored throughout the Province and research is underway on gill diseases of various types, especially bacterial gill disease, the most common problem in Ontario. The goal is long-term prevention and control.

PROJECT TITLE	RESEARCHER
Bacterial gill disease in Rainbow Trout	Ferguson
Alternative protein sources in practical diets for Rainbow Trout	Hilton
Gill disease of fish	Ferguson
Development of new processing methods of practical diets for Rainbow Trout	Hilton

OTHER

Mink is the most significant fur-bearing animal in the Province as regards dollar value. The fur-bearing animal programme at Guelph emphasizes the gathering of basic information on normal reproduction and mortality rates in commercially produced mink, control of severe infectious disease including *Pseudomonas aeruginosa* pneumonia, enteritis caused by *Campylobacter jejuni*, and monitoring and eradication of Aleutian disease.

The peroxisome: A freeze-fracture study	Singh
An in vivo assay of captan's mutagenicity in mammals	Goldberg
Structural differences of airways in domestic animals and their significance in respiratory diseases	Yamashiro
Combined toxicity of mercury, lead and cadmium in domestic ducks	Bhatnagar
Surveillance of parasitic diseases of domesticated animals in Ontario	Slocombe
Experimental oncology	Valli
SDA: an important coronavirus infection in the rat	Percy
Surveillance of diseases in laboratory animals	Percy
Control of pasteurellosis in the rabbit	Percy
Investigation of staphylococcus infection in neonatal mink	Yager, Hunter, Prescott
Development of a vaccine against salmonella typhimurium in cattle	Butler, Gyles
Investigation into reproductive failure and normal mortality of mink ranches	Hunter
Embryo micromanipulation	Johnson, Buckrell

FIELD CROPS

Grain

Cereals research centres on improving cropping technology for the use of livestock and cash crop farms. Researchers test breeding populations, germplasm lines, and cultivars for yield, quality, and lodging and disease resistance. Cooperative testing programmes with other research stations help determine the suitability of new selections for various conditions across the Province and of new crops such as winter triticale and hard red winter wheat. Performance testing of hybrid corn for whole plant silage is a new research effort. Factors affecting performance of various cultivars and hybrids with different environmental conditions and soils are under investigation and management techniques, especially for intensive cereal production, are being developed.

Evaluation of the potential of breeding corns for whole-plant corn silage	Jones
Ear mold and mycotoxins in corn	Jones
Development and evaluation of corn breeding techniques	Kannenberg, Jones
Quality and yield of corn silage	Buchanan-Smith, Daynard, Jofriet
Inter-plant competition in corn	Daynard
Quality in Ontario grain corn	Daynard
Genotypic and environmental effects on grain filling and grain maturity in corn	Daynard
Evaluation of corn hybrids	Hunter, Kannenberg
Development and improvement of corn breeding populations and inbreds	Kannenberg, Jones
Production studies on barley and oats	Gamble
Cytogenetic studies in cereals	Hunt, Kasha, Reinbergs
Crop improvement through plant cell and tissue culture	Anderson, Kasha
Testing new improved varieties of cereals	Hunt, Reinbergs
Haploid production and utilization in cereals	Kasha, Reinbergs
Winterhardiness of winter cereals	Hunt, McKersie, Pauls

PROJECT TITLE	RESEARCHER
Breeding new and improved varieties of winter and spring wheats	Hunt
Breeding improved varieties of spring barley	Reinbergs
Breeding improved varieties of winter barley	Reinbergs
Breeding improved varieties of oats	Reinbergs
Effects of crop sequence on soil structure, stability, and productivity	Vyn, Ketcheson
Breeding improved varieties of winter triticale	Hunt
Microspore culture in wheat	Kasha

Forage

Forage crops provide feed for dairy and beef cattle, and improve soil structure and fertility. Research on the first use aims at improving livestock production per unit area of land; through developing superior cultivars and modifying management practices, researchers hope to increase and stabilize forage production.

Because of new varieties and changes in fertility and harvesting methods, forage mixtures are being re-evaluated. Crop scientists are also considering the role of new species and agronomic practices for pastures and soil conservation. Basic research looks at the physiology genetics, and biotechnology of the plant.

Forage quality determination	Winch
Seed production studies in birdsfoot trefoil and perennial ryegrass	Gamble
The relationship of autumn managements to persistence and succeeding yield in perennial forages	Fulkerson
Selection for forage yield in grasses	Christie
Forage cultivar evaluation	Christie, Bowley
Methods of hay preservation	Fulkerson
Forage seed production studies	Fulkerson
Winterhardiness of perennial forages	McKersie, Christie, Bowley
Protein degradation in ensiled alfalfa forage	Buchanan-Smith, McKersie, Bowley
Use of infrared spectroscopy for estimating the quality of forages	Winch
Evaluation of forages for use in pasture systems	Winch
Pasture systems	McLeod, Winch
A legume ideotype for grain crop sod-seeding	Clark, Christie, Bowley
Decomposition of incorporated forage legumes	Clark
Breeding for improved quality in perennial legumes	McKersie, Christie, Bowley
Increasing seed yield in birdsfoot trefoil	Bowley
Interspecific interactions in breeding forage crops	Bowley
Introgressive hybridization of forage legume species	Bowley
Screening forage legumes for tolerance to wet soils	McKersie
Application of tissue culture technology to forage legumes	Pauls, Bowley
Determinants of drying in forage legumes	Clark
Annual and perennial pasture species	Clark
Somatic embryogenesis in alfalfa	McKersie

Protein and Oilseed

In the last 20 years, the use of protein and oilseed crops as a source of energy and protein for livestock and humans has become widespread. Research on these crops, in particular soybeans, canola, white beans, and peanuts, aims at improved production efficiency. Breeding programmes are designed to increase yields while maintaining or improving the quality. Variety testing, which includes mustards and flax, provides data to support licensing of superior lines and is the basis for variety recommendations. Management studies for soybeans, canola, and white beans are the basis for guiding farmers in the most efficient method of production for maximum returns. The research programme has both basic and applied aspects, ranging from biotechnology to field-scale cooperative work with growers.

Whitebean breeding and evaluation	Beversdorf, Hume, Michaels
Seed vigour of soybean and fieldbean	Gamble
An evaluation of the economic feasibility of irrigating peanuts in southern Ontario	Clark, Stonehouse, Brown
Management systems for winter canola	Beversdorf, Hume
Testing and management of spring oilseeds	Beversdorf, Hume
Improving nitrogen fixation and yield in soybeans and white beans	Beversdorf, Hume
Soybean breeding and evaluation	Beversdorf, Hume
New management systems for field bean production	Beversdorf, Hume, Michaels
Effects of genotype and environment on quality aspects of soybeans and rapeseed	Beversdorf, Hume
Spring rapeseed breeding and evaluation	Beversdorf, Hume
Winter rapeseed breeding and evaluation	Beversdorf, Hume
Peanut breeding	Michaels, Tanner
Genetic tranformation in canola	Nazar, Wildeman

HORTICULTURAL CROPS

Vegetables

Cultural studies are underway to improve seed quality of potatoes, to modify cultural practices to increase asparagus yields, and to evaluate new production techniques for tomato greenhouses. Breeding better potato, rutabaga, and asparagus cultivars is another important part of the research programme. On the food side, scientists are looking into the nutritional characteristics of cauliflower, greenhouse tomatoes, and lettuce.

Basic studies examine the effects of modifying environmental and physiological factors that affect plant growth to improve the photosynthetic activity of horticultural species. A matter of importance now is the assessment of tolerance to atmospheric pollutants and the development of ways to reduce or eliminate the influence of these pollutants on plants.

PROJECT TITLE	RESEARCHER
Factors influencing the incidence of black speck in cauliflower curds	Riekels
Cultural studies with field and greenhouse vegetables	Tiessen
Plastic mulch trials	Tiessen
Responses of vegetable crops to environmental factors	Ormrod
Potato production practices for Ontario	Rowberry
Breeding of rutabagas and asparagus	Harney, Nonnecke, Souza, Machado, Tiessen
Breeding and evaluating potato varieties for Ontario	Coffin
Asparagus variety improvement and cultural practices	Harney, Tiessen, Peterson
Rutabaga seed production	Nonnecke, Kramp
Significance of individual sugars to chipping quality of stored potatoes	Yada, Stanley, Rowberry

Fruit

Guelph's fruit research programme focuses on maturity and post-harvest physiology of tree fruits and related management practices, and on the breeding and management of strawberries and raspberries. Studies on the various stages of development allow horticulturists to predict accurate harvest dates for fruit, to assess the effect of various chemicals on the storage quality of apples, and to recommend methods for controlled atmosphere storage of apples.

Strawberry breeding and management studies are producing cultivars that extend the fresh market season and make mechanical harvesting and processing feasible. Raspberry research provides the same amenities to growers, in particular cultivars for pick-your-own operations and mechanical pruning.

Strawberry Breeding	Evans
Raspberry breeding	Evans
Responses of fruit crops to environmental factors	Ormrod
Effect of pre-harvest and post-harvest factors upon the physiology and regulation of fruit ripening	Lougheed, Murr
Maturity studies of Ontario apples	Lougheed, Proctor
Raspberry management	Evans
Production techniques for tree fruits, particularly apple	Lougheed, Proctor

Ornamentals

A broad selection and high quality in ornamentals are the main concerns of ornamentals researchers. These they seek to provide through cultivar development and cultural improvements. To keep Ontario growers competetive, a concerted effort is underway to find means of reducing energy and labour requirements for the industry, to maximize plant productivity, and to extend the storage life of cut flowers. Researchers are promoting the use of Ontario grown herbaceous and woody ornamentals for indoor landscaping. As with vegetables, stresses caused by air and soil pollutants and other environmental factors are being assessed so that corrective measures can be devised.

Responses of ornamental crops to environmental factors	Ormrod
Integrating greenhouse control of lighting, CO^2 and temperature for increased plant productivity	Grodzinski
Breeding and mass in vitro propagation of flowering ornamentals	Harney, Nonnecke
Competitive ability of turfgrasses	Eggens
Turfgrasses species and cultivar evaluation	Eggens
Field production, handling and performance of nursery stock	Lumis
Container growing woody plants	Lumis
Production and handling practices influencing keeping quality of cut roses	Grodzinski, Murr, Tsujita
Effect of mowing height and clipping removal on turf growth	Eggens
Physical, chemical and environmental parameters in container growing	Lumis
The influence of cultural practice on landscape trees	Lumis

SOIL, WATER, AND WASTE MANAGEMENT

Soil management research has a double goal: to increase the profitability in crop production and to sustain a productive soil resource. Emphasis is placed, therefore, on developing soil test calibrations, making efficient use of nitrogen, and developing crop alternatives and tillage practices that increase organic matter content and reduce erosion.

Water management research is necessary to maintain the high quality of water for agriculture and to ensure that such water is not polluted by agricultural practices. Research is in progress to refine control measures which safeguard groundwater quality, to reduce fertilizer and soil runoff, and to quantify the impact agriculture, particularly land drainage, has on the amount and timing of stream flow.

Agrometeorology helps the farmer take advantage of climatic opportunities and combat climatic problems whenever possible and searches for fundamental information on the way plants respond to atmospheric and soil conditions. Much of the work is interdisciplinary. Several projects are underway including one to assess the possibility of increasing corn yields by irrigation.

Many agricultural by-products are high in energy which can be recovered in a number of ways. Waste management research seeks to expand the usefulness of these by-products by adapting digestors for methane production from manure and by determining how useful manure is in crop production. Better manure handling systems are being designed to give greater returns on energy and capital expenditures. Researchers are also studying different microorganisms which will break down crop residues rapidly or increase the digestibility of such residues for livestock feed.

PROJECT TITLE	RESEARCHER
Application of trajectory simulation modeling to agricultural problems	Thurtell, Kidd
Observation, compilation and analysis of current and past weather records	Brown, Gillespie, King, Kidd
Assessment of the potential for increasing yields of field corn with irrigation	Brown
Methods to evaluate the effects of pesticides in the aquatic ecocystem	Kaushik, Solomon
Determination of sediment contributing areas	Dickinson
Transport, transformation and properties of organic carbon in streams draining agricultural land	Kaushik
Effect of land drainage on streamflow	Irwin, Whiteley
Determination of soil erodibility	Dickinson
Remedial strategies for controlling sediment transport	Dickinson
The effect of agricultural activities on levels of NO^3-N and related constituents in ground water	Whiteley
A mathematical model for the investigation of tube drainage effects on surface and subsurface streamflow components	Stammers
Control of soil erosion and associated water pollution	Dickinson, Rudra
Drainage benefit	Irwin
Forage systems as nitrogen sources in crop production	Sheard
Interaction of soil drainage, species and plant nutrition	Sheard
Phosphorous and potassium requirements for alfalfa production	Sheard

PROJECT TITLE	RESEARCHER
Effects of crop sequence on soil structure, stability, and productivity	Vyn, Ketcheson
Soil factors limiting corn yield in Ontario	Miller, Mitchell
Assessment of the potential for increasing yields of field corn with irrigation	Brown
A maximum alfalfa yield project for Ontario	Sheard
Microbial activities in agricultural soils	Trevors
Winter application of manure on alfalfa	Sheard
Development of methodology to characterize some physical properties of soil under different tillage treatments	Groenevelt, Kay
Effect of erosion on soil properties and corn yield	Groenevelt
Availability of manure N.	Beauchamp
Nitrogen availability in southern Ontario soils	Beauchamp
Soil test calibration for the major field crops	Beauchamp, Sheard
Boron in Ontario soils	Evans
Development and evaluation of methods for prediction of macro and micronutrient requirements of crops	Bates
Use of sewage sludge on agricultural land with emphasis on plant availability of heavy metals	Bates
Water and chemical transport in soils	Elrick
Fertility requirements for maximum corn yield at Elora	Miller, Mitchell

LAND USE

OMAF's development policies are based, in part, on research from the Agricultural Land Use programme. Scientists develop criteria for identifying areas in the Province suitable for specialty crops; this helps in implementing Foodland guidelines. The interpretation of soil inventory information for growers and planners is an important part of the programme.

PROJECT TITLE	RESEARCHER
Study of absentee landownership, phase III	Mage
Impact of farm tenancy on agricultural land use	Van Vuuren
Ontario farm real estate prices	Gray
Natural areas in the rural Ontario land use system	Moss
Interpretation of soil survey information for specialty crop production	MacKintosh
Micropedologic characterization of the major soil types in Ontario	Protz
Assessment of the potential for increasing yields of field corn with irrigation	Brown
Economic evaluation of municipal outlet drainage in eastern Ontario	Van Vuuren
Boron in Ontario soils	Evans
An assessment of the frequency and magnitude of wind erosion and its relationship to soil type and systems of agricultural production in	Nickling
Part-time use of the agricultural resource base in Ontario	Mage
Development of a rating system to evaluate agricultural land at the local level — phase I	Brown, Gillespie, Hilts, Miller
Land rating for agriculture	Smit
Development of a rating system for soil compaction susceptibility	McBride,

PEST MANAGEMENT AND DISEASE CONTROL

Insects destroy an estimated 15% of Ontario's agricultural production. Insecticides are an important part of control, and the regular evaluation of these substances and methods of applying them ensures that farmers have the best chemical controls available. Integrated pest management (IPM), involving the relationship between insect numbers and damage, and necessitating monitoring programmes, saves growers money and reduces the quantity of pesticides in the environment. At the same time, alternatives to chemical control are being sought; bio-control of insects, with predators and parasites primarily, is the main alternative under investigation.

Plant disease research is involved in disease detection, identification of causal agents, and development of controls. Basic research is going on into how weather affects the occurence of disease and its spread, on the action of systemic pesticides, and on the development and persistence of soil-borne and air-borne strains of plant disease agents. Pesticide improvement and integrated disease control are goals of the programme which is also searching out data for breeding disease resistance into crop species.

Without proper weed control methods, the advantages of improved crop varieties and management cannot be fully realized. The weed programme places stress on developing, evaluating, and integrating chemical and non-chemical control methods for farmers. Basic research underlies this applied work: biology of weeds, physiology of herbicides, and the interactions among weed control methods and the environment.

Weeds

Industrial oils and waxes from weeds	Alex, Anderson, Rattray
Pest diagnostic and advisory clinic	Kelly, Wukasch
Breeding of rutabagas and asparagus	Harney, Nonnecke, Souza, Machado, Tiessen
Gentics, plant breeding and physiology of herbicide tolerance in plants	Souza, Machado
Competition among weed species and crop plants	Alex
Biology of perennial and annual weeds	Anderson, Dekker
To assess the interference effects of weeds on crop plants	Anderson, Dekker
Ecology of problem weeds	Alex
Surveys of weeds in Ontario	Alex
Biological control of weeds	Alex
Evaluation of new herbicides and combinations of herbicides for control of annual and perennial weeds in field crops	Anderson, Swanton
Weed control in established stands of alfalfa, birdsfoot trefoil and legume grass mixture	Anderson, Swanton
Weed control in fruit crops	Cain
Weed control in ornamental and woody crop situations	Cain
Mechanisms of hebicide action and selectivity	Stephenson
Plant growth regulating properties of triadimefon	Fletcher

Insects

Biology and control of the potato stem borer on field corn	Ellis, Beattie
Control experiments for pests of forage and field crops	Ellis, Beattie
Threshold limits in pest control	Ellis, Beattie
Biology, ecology and control of the onion maggot	McEwen
Pesticides for minor crops	McEwen
Insect pests of turfgrass	Sears
Biology, ecology and control of the cabbage maggot	Sears

PROJECT TITLE	RESEARCHERS
Pest diagnostic and advisory clinic	Kelly, Wukasch
Biology of orchard insects	Laing
Mechanisms of resistance in Ontario houseflies	Solomon
Biology of pests on forage and cereal crops	Ellis
Biosystematics of decay-related diptera	Marshall
Sex pheromone mediated biology and pheromone chemistry of noctuid pests of corn and tobacco	Teal
Disease	
Virus disease of the commercial tomato crop	MacNeill
Fungal parasites of nematodes	Barron
Pest diagnostic and advisory clinic	Kelly, Wukasch
Systemic fungicides: efficacy for control of cereal diseases	Edgington
Systemic fungicides — efficacy for control of vegetable diseases	Edgington
The development of pathogenic races in erysiphe graminis tritici, the cause of powdery mildew of wheat	MacNeill
Management of foliar diseases in onions	Sutton
Determination of the bean root rot potential of Ontario fields	Hall
Management of gray mold in strawberries	Sutton
Disease management practices for improved productivity of winter wheat	Sutton
Biology and control of low-temperature-tolerant plant pathogenic fungi	Burpee
Integrated management of turfgrass disease	Burpee
Monoclonal antibodies to pathogenesis-related enzymes in tomato	Ellis

ECONOMICS

Economics research covers two programmes: production, farm management, and resources, and marketing, trade, and policy. To help farmers evaluate their operations, computer models are being developed for hog farrow-to-finish farms and for beef feedlots. In farm management, a more precise method of classifying farms is being worked out. Studies on farm finance and risk management are underway to assist farmers and to help in developing policy. Energy conservation technologies are under assessment along with the detrimental effect of some cropping practices.

Market studies, of particular value to farmers, include an examination of options farmers have to reduce risk and improve returns such as the use of futures markets, contracting, and electronic auctions. Economists are developing models to help forecast prices and to understand the impact of policies better. Farm incomes and various marketing options are analyzed to assist in policy development.

PROJECT TITLE	RESEARCHERS
A planning model for beef production on farms with integrated cow-calf feedlot systems	Pfeiffer
A simulation model for long range planning and expansion on swine farms	Pfeiffer
Ontario dairy farm accounting project	Driver
Development and application of a risk simulator	Driver
Agroeconomics of hybrid poplar in eastern Ontario	Phillips
Energy utilisation in the Ontario agri-food system	Phillips
Predicting the changing size structure of Ontario dairy herds	Clark
Operations management survey—Ontario agribusiness industry	Funk
A study of the debt carrying capacity of Ontario farms	Clark
Economic analysis of alternative crop rotation systems for producing grain corn in Ontario	Clark, Stonehouse, Kay, Christofides
Quota values and demand for quota in the Ontario dairy industry	Brinkman, Stonehouse, MacGregor, Forster
Planning minimum risk market hedging and production strategies on cash crop beef feedlot farms in southwestern Ontario	Clark, Driver, Martin
Impacts of tillage and crop rotation combinations on land degradation and economic viability of the farm firm	Stonehouse, Van Vuuren, Vyn, Kay
Socio-economic impact of acid rain on agriculture in Ontario: a review of the literature	Phillips
Forecasting beef and hog prices	Martin
A price forecasting mechanism for the Canadian beef-pork sector	Martin
The use and development of econometric models for agricultural commodities	Meilke
Farm structure and performance in Canada	Brinkman
Evaluation of total factor productivity in Canadian agriculture	Brinkman

PROJECT TITLE	RESEARCHER
Evaluation of the productivity of Ontario agricultural research, phase II	Brinkman
Identification and evaluation of market opportunities for Canadian manufacturers in the agricultural liquid handling equipment	Funk
Segmentation of the market for agricultural inputs	Funk
Supply management and quota values	MacGregor
The influence of advertising and price differentials on market shares in the butter and margarine markets	Goddard
Marketing strategies for Ontario grain producers	Martin
Marketing strategies for Ontario livestock operations	Martin
Input demands in the Canadian meat processing industry	Goddard
Analysis of business strategies for local grain elevators and farm supply outlets	Harling

ENGINEERING

Engineering research includes crop mechanization and farm buildings. Guelph's engineers are working to improve the equipment and methods used in crop production and seeking alternate energy sources for field power units. They are developing technology for such things as the separation of protein-rich leaves from stems in forage, safer silage storage, and high density packaging of hay for transport. Information sought on the fundamental soil dynamics of tillage tools will allow them to design tools to minimize soil erosion and conserve energy.

Studies on farm buildings focus on the environment in which pigs live. Work on heat exchangers for recovering energy is coupled with air distribution studies to maximize the benefits of the exchangers. Solutions are also being sought to the problems of icing and dust in commercial exchangers. Basic research focuses on how thermal forces affect air mixing in livestock barns and the effect of lower critical temperature on pig behaviour, growth, and well-being.

Energy self-sufficient farm systems	Southwell
Vegetable oils as fuels for diesel engines	Southwell
Heat exchangers for swine buildings	Ogilvie, Pattie
Evaluation of alternative manure-handling systems on the basis of efficient use and retention of energy and economic viability	Stonehouse, Ogilvie, Pos, Beauchamp
Energy accounting	Southwell
Evaluation of floor type and pig density	Ogilvie
Evaluation of the formation, storage, handling and feeding of large hay bales	Mowat, Winch, Bilanski
High-density packaging of forages for on-farm feeding or for cash-crop sale	Bilanski
Economics of biogas and protein for livestock feeding derived from livestock manures	Driver, Stonehouse, Young
Analysis of corn grain yield in relation to tillage and climatic conditions	Farazdaghi, Lee
Measurement of floor and wall pressures in a bottom-unloading farm silo	Jofriet
Development of an on-farm silage separating (fractionating) unit	Mowat, Bilanski
Toxic gas formation in silo fermentations	Meiering
The stability of sprayed-on polyurethane insulation in steel-clad fruit and vegetable storage buildings	Jofriet
Natural ventilation	Ogilvie, Iwaniw
Heat exchangers and ventilation	Ogilvie, Iwaniw
Soil tool geometrics and physical properties of soils	Lee

FOOD AND FOOD QUALITY

Guelph's food research programme centres on increasing the availability of Ontario grown food to the Canadian public and to export markets. To do this, the changes in the chemical and physical composition of raw materials are being studied in the processing and storage stages. Researchers are seeking more objective methods of evaluating food quality. Work is underway to improve the recovery of by-products from food processing, such as whey from cheese production and to use these by-products in existing and new food products.

Long term effects of dietary trans fatty acids	Walker
Metabolic activities of phychrophilia and incidence of opportunistic microorganisms in relation to the quality of dairy food products	Cunningham

PROJECT TITLE	RESEARCHER
Controlled atmosphere (CA) storage of apples	Lougheed, Murr, Proctor
Controlled atmosphere storage of vegetables	Lougheed, Murr
Microbial utilization of liquid agricultural and industrial carbohydrate wastes from the food and fermentation industries	Cunningham
Microorganisms as potential food sources (single cell protein) for animal and human food supplementation	Cunningham
Quality testing of Canada soft wheats with Chopin Alveograph	Rasper
An investigation of the major factors influencing beef tenderness	Jones, Stanley
Measurement of the surface color of tomatoes using fiber optics	Stanley
Moisture mobility, product quality and functionality of meat emulsions due to binders, extenders. and meats	Usborne, Mittal
Characterization and nutritional assessment of oilseeds and processed vegetable oils from newly-developed varieties of Ontario canola	Holub
The role of water soluble pentosans in the process of soft wheat flour chlorination	Rasper
Control of late gas blowing in cheddar cheese	Irvine, Myhr
The coagulation and separation of the whey protein albumin from cheese whey. The manufacture of these whey proteins into a	Bullock, Irvine
Processing of canola oil	Deman
Quality of milk and dairy products	Deman

PROJECT TITLE	RESEARCHER
The bioavailability of ZN, CU, FE and MN from extended meat foods	Bettger, Phd student
Effects of sex, diet and slaughter weight on retail quality of lamb	Gullett
Evaluation of retail quality of selected frozen vegetables	Gullett
Screening for controlled atmosphere amelioration of chill-injury in fruits and vegetables	Parkin
Investigating the stability of frozen milk	Parkin
Significance of individual sugars to chipping quality of stored potatoes	Yada, Stanley, Rowberry
Application of reverse osmosis in the manufacture of yoghurt	Duitschaever
Nutritional evaluation of heated canola oil	Alexander
Quality evaluation of apple and grape juice concentrated by reverse osmosis	Duitschaever
Post-harvest nutrient retention in Ontario-grown vegetables	Lougheed, Alexander
Physico-chemical changes of milk proteins in heated milk systems on the rheological properties of yoghurt	Kakuda
Bio-fuel fermentation control	Meiering
Use of fiber optics and computer-operated systems in the optimization of quality in meat products	Swatland
Lipid oxidation in mechanically deboned poultry, meat	Kakuda
The effects of short-term CA storage on tomato quality	Yada
Elucidation of cold temperature processability of potatoes (solanum SPP.)	Yada, Parkin, Grodzinski, Coffin

Bibliography

This bibliography lists all publications resulting from research completed during the period April 1, 1985 to March 31, 1986. The publications report on research programmes and projects approved by the Agricultural Research Institute of Ontario and funded completely or in part by the Ontario Ministry of Agriculture and Food.

AGRICULTURAL LABORATORY SERVICES

PERIODICALS

Braun, H.E., Frank, R. and Miller, A., 1985. "Residues of cypermethrin in milk from cows wearing impregnated ear tags." *Bull. Environ, Contam. Toxicol.* 35: 61-64.

Frank, R., Braun, H.E., Sirons, G.H., Rasper, J. and Ward, G.G., 1985. "Organochlorine and organophosphorus insecticides and industrial pollutants in the milk supplies of Ontario - 1983." *J. Food Protection.* 48:(6): 499-504

Frank, R., Campbell, R.A., and Sirons, G.J., 1985. "Forestry workers involved in aerial application of 2,4-Dichlorophenoxyacetic acid (2,4-D): exposure and urinary excretion." *Arch. Environ. Contam. Toxicol.* 14: 427-435.

Frank, R., Northover, J., and Braun H.E., 1985. "Persistence of captan on apples, grapes, and pears in Ontario, Canada, 1981-1983." *J. Agric. Food Chemistry.* 33. 514.

Frank, R., Stonefied, K.I., and Suda, P., 1985. "Background elemental content of animal feeds, Ontario, Canada, 1978-82." *Bull. Environ. Contam. Toxicol.* 35: 689-695.

Frank, R., 1986. "Temik (aldicarb) and potato production." *Agri-Book Magazine.* 12(5): 18 and 36.

Frank, R., 1985. "Are pesticides necessary?" *Agriculture.* 42(3): 18-19.

Frank, R., 1986. "Current issues in pesticides and fruit production." *Canadian Fruit Grower,* Annual Chemical Issue. Feb. p. 9 and 10.

Frank, R., 1985. "Farm water quality and pesticides." *Highlights.* 8(4): 18.

Frank, R., 1985. "Guide to handling and applying Lasso® (alachlor)." *OMAF News.* April. p. 8.

Ripley, B.D., 1985. "Gas chromatography-mass spectrometry of acylalanine fungicides." *J. Agric. Food Chemistry.* 33: 560-563.

Ritcey, G., McEwen, F.L., Frank, R., and Braun, H.E., 1985. Abstr. in *Pesticide Res. Rpt. 1985, Exp. Comm. on Pesticide Use in Agric.* "Captan residues in raspberry fruit." p. 412. "Dimethoate residue in eggplant." p. 404. "Dimethoate residues in onions as a result of foliar treatment." p. 410. "Residues in carrots." p. 400.

Ritcey, G., McEwen, F.L., Frank, R., and Ripley, B.D. Abst. in *Pesticide Res. Rpt. 1985, Exp. Comm on Pesticide Use in Agric.* "Fungicide residues in onions and soils." p. 411. "Minor crops, fungicide residues." p. 405.

PROCEEDINGS

Frank, R., 1986. "Maintaining quality of water on the farm." *Crops Day,* 13 Feb. 1986. Summary Eastern Ont. Farmers Week, KCAT.

CENTRALIA COLLEGE OF AGRICULTURAL TECHNOLOGY

PERIODICALS

Forrest, R.E. "Assessing the benefits of plowdown forage crops." *Highlights* ag. res. Ont. 8(3): pp.7-10.

PROCEEDINGS

Forrest, R.E. "Cash in on plowdown forage crops." *Proc. Forage - Your Key to Profit.* Feb. 1986.

BOOKS, THESES, REPORTS

O'Toole, J.J. and Forrest, R.E. *1985 CCAT Agronomy Research Report.* Jan. 1986. 66 pp.

ECONOMICS AND POLICY COORDINATION BRANCH

PERIODICALS

Fisher, G.A., 1985. "A comparison of grain corn production costs in Ontario and the United States." *Ontario Corn Producer.* July-Aug. p. 6.

Fisher, G.A., 1985. "Canadian corn production." *Ontario Corn Producer.* June. p. 20.

Fisher, G.A., 1985. "Considerations in reducing corn production costs." *Ontario Corn Producer.* Apr. p. 36.

Fisher, G.A., 1985. "Harvesting and marketing your corn crop." *Ontario Corn Producer.* Oct.-Nov. p. 13.

Fisher, G.A., 1985. "Trends in grain corn production costs." *Ontario Corn Producer.* Dec. p. 16.

Fisher, G.A., 1985. "Updating custom harvesting charges in Ontario." *Ontario Corn Producer.* May. p. 16.

Fisher, G.A., 1986. "Cash crop considerations for 1986." *Ontario Corn Producer.* Jan. p. 17.

Fisher, G.A., 1986. "Using custom farmwork services on your farm." *Ontario Corn Producer.* Feb. pp. 26-27.

Lentz, Gary, 1986. "Outlook conferences predict most low prices will continue." *OMAF News.* Jan. p. 17.

Lentz, Gary, 1986. "U.S. farm bill will drive down price supports." *OMAF News.* Jan. p. 12.

PROCEEDINGS

Economics and Policy Coordination Branch. 1986. *Proceedings of the Ontario Agricultural Outlook Conference.* Ec. Br. OMAF. Jan. 47 pp.

BOOKS, THESES, REPORTS

Economics and Policy Coordination Branch. 1985. *Vegetable Crops - Estimated Production Costs Ontario, 1985.* Economic Branch, OMAF. Rpt. No. 85-04. July. 53 pp.

Fisher, G.A., 1986. *A Survey of Custom Farmwork Rates Charged in Ontario, 1985.* Ec. Br. OMAF. Rpt. No. 86-01. Jan. 27 pp.

Fisher, G.A., 1985. *An Ontario Tomato Production Update.* Ec. Br. OMAF. Oct. 18 pp.

Fisher, G.A., 1985. *Cash Rental Rates in Ontario, 1984.* Ec. Br. OMAF. Rpt. No. 85-02. July. 14 pp.

Fisher, G.A., 1985. *Grain and Forage Crops - Estimated Production Costs Ontario, 1985.* Ec. Br. OMAF. Rpt. No. 85-03. July. 25 pp.

Fisher, G.A., 1985. *Greenhouse Vegetable Statistics - Production, Areas, Yields and Returns for Ontario.* Ec. Br. OMAF. Apr. 17 pp.

Fisher, G.A., 1985. *Processing Tomato Statistics - Production, Areas, Yields and Returns for Ontario and United States.* Ec. Br. OMAF. Apr. 26 pp.

McKibbon, E.D., 1985. *Fruit Crops - Estimated Production Costs Ontario, 1985.* Ec. Br. OMAF. Rpt. No. 85-05. July. 49 pp.

McKibbon, Errol and Buth, Dirk, 1985. *Raspberry Production Costs in Ontario, 1984.* Ec. Br. OMAF. Rpt. No. 85-06. Sept. 19 pp.

Fisher, G.A., 1986. *Horticultural Production - Southwestern Ontario.* Ec. Br. OMAF. Jan. 12 pp.

Fisher, G.A., 1986. *Processing Tomato Statistics - Production, Yields and Returns for Ontario and United States.* Ec. Br. OMAF. Mar. 35 pp.

HORTICULTURAL RESEARCH INSTITUTE OF ONTARIO

PERIODICALS

Arnold, N., Chong, C. and Binns, M., 1985. Elimination of the grey disorder in flue-cured tobacco. *Z. Acker Pflanzenbau*, 155(4): 274-280.

Biggs, A.R. and Miles, N.W., 1985. "Suberin deposition as a measure of wound response in peach bark." *HortSci.* 20(50): 903-905.

Blom, T.J., 1986. "The climate control computer." *Can. Flor. Grnhse. Nurs.* 81(3): 47-48.

Blom, T.J., 1986. "Greenhouse floriculture for import replacement." *Flowers Can. News.* Jan. p. 11.

Blom, T.J. and Piott, B.D., 1985. Abstr. in *Rpt of Comm. on Hort. Res.* Can. Hort. Council. "The effect of Paclobutrazol on pot chrysanthemums." p. 105.

Blom, T.J. and Piott, B.D., 1985. "Alstromeria." *Can. Flor. Grnhse. Nurs.* 80(12): 52, 54-55.

Blom, T.J. and Piott, B.D., 1985. "Heating season 84/85." *Growers Notes.* June. pp. 4-5.

Blom, T.J. and Piott, B.D., 1985. "Spacing trials with anemone (Mona Lisa) during the 1984/85 season." *Can. Flor. Grnhse. Nurs.* 80(11): 51.

Blom, T.J. and Ingratta, F.J., 1985. "The use of polyethylene film as greenhouse glazing in North America." *Acta. Hort.* 170: 69-80.

Blom, T.J., Piott, B.D., and Tsujita, J.M., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "The effect of Paclobutrazol on poinnsettas." p. 105.

Chiang, M.S., Chong, C. and Crete, R., 1985. "Inheritance of glucosinolates in cabbage." *Cruciferae Newsl.* No. 10. p. 40.

Chong, C., 1985. Abstrs. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council "Influence of media and supplemental lighting on rooting of junipers." pp. 105-106. "Rooting woody ornamentals with indolebutyric acid." p. 106. "Use of styrofoam in propogating rooting medium." p. 106.

Chong, C., 1985. "New research for ornamentals." *Landscape Ont.* 13(2): 34.

Chong, C., 1985. "The ornamental plant industry." *The Grower* 35(5): 19, 22.

Chong, C., 1985-86. "Propogating junipers in different rooting media under two light regimes." *Landscape Trades.* 6(7): 10-11.

Chong, C., 1985. "Tissue culture. A general overview." *Nurs. Trades B.C.* 4(4): 6-8.

Chong, C. and Pua, E.-C., 1985. "Carbon nutrition of Ottawa 3 apple rootstock during stages of *in vitro* propogation." *J. Hort. Sci.* 60(3): 285-290.

Chong, C., Chiang, M.S. and Crete, R., 1985. "Studies on glucosinolates in clubroot resistant selections and susceptible commercial cultivars of cabbages." *Euphytica.* 34: 65-73.

Chong, C., Lumis, G.P., Cline, R.A. and Reissmann, J.H., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Growth and chemical status of poplar plants grown in Field-grow containers." p. 106.

Chu, C.L., 1985. "New era of storage technology for Ontario's apple industry." *The Grower.* 35(4): 6-7.

Chu, C.L. and Wood, L.D., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Rootstock effect on harvest maturity of 'Macspur McIntosh' apples." p. 110.

Chu, C.L., Miles, P.L., and Wood, L.D., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Use of Internal ethylene concentration as a maturity index for apples." p. 110.

Chudyk, R.V., 1985. Editor. *Rpt. of the Ont. Grape & Wine Res. Comm.* 54 pp.

Chudyk, R.V. and Gadd, P.M., 1985. Abstr. "Automated microbiological quality control for the wine industry." *Rpt. of Ont. Grape & Wine Res. Comm.* p. A-19.

Chudyk, R.V. and Simpson, M.L., 1985. "Rapid preparation of grape samples for chemical analysis." *Eastern Grape Grower & Winery News.* 11(4): 37-38.

Chudyk, R.V., Watson, W., and Gadd, P.M., 1985. Abstr. "Computer analysis of the commercial wine grape crop." *Rpt. of Comm. Hort. Res.* Can. Hort. Council. p. 109. Rpt. of Ont. Grape and Wine Res. Comm. p. A-19.

Cline, R.A., 1985. Abstrs. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Paper mill sludge as a soil amendment on agricultural land." p. 103. "Replant study with apple." p. 103. "Soil management and irrigation effects on peach canker in the Niagara peninsula of Ontario." p. 103.

Cline, R.A., 1985. Abstrs. in *Rpt. of Ont. Grape and Wine Res. Comm.* "Cultural trials." pp. A10-A11. "Trickle irrigation studies." p. A11.

Cline, R.A., 1985. "Nutrition." *Rpt. of Ont. Grape and Wine Res. Comm.* pp. A9-A10.

Cline, R.A. and Reissman, H.J., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Apple fruit analysis." p. 103.

Courtney, W.H., 1985. "Utilizing the genetic base in tomato breeding." *Highlights of agric. res. in Ont.* 8(3): 1-3.

Courtney, W.H. and Banfield, G.E., 19 Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Cultivar testing of processing tomatoes." p. 112. "Northern Tomato Exchange Program Trial 1985." p. 112.

Daigneault, L. and Chong, C., 1985. "Rooting of woody ornamental species in response to willow extract and auxin." *The Plant Propagator.* 31(4): 12-14.

Dale, A., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Processing strawberry production research program." p. 112.

Dale, A. and Evans, W.D., 1985. Abstr. in *Rpt. of Comm. on Hort. Council. "Strawberry breeding." p. 112.*

Dale, A., Chandler, C. and Vandenberg, A.A., 1985. Abstr. in Rpt. of Comm. on Hort. Res. Can. Hort. Council. "Processing strawberry production research program." p. 112.

Dale, A., Cline, R.A., and Chandler, C., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Soil management in highbush blueberries." p. 112.

Dale, A., Vandenberg, A.A., and Chandler, C., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Tayberry." p. 112.

Edinger, W.D. and Holman, L.L., 1985. Abstr. "Evaluation of the conductivity method for measurement of tartrate stability." *Eastern Grape Grower & Winery News.* 11(4): 38.

Edinger, W.D. and Holman, L.L., 1985. Abstrs. "Evaluation of the conductivity method for evaluating potassium bitartrate stability." "Improvement of the Ripper method for SO^2 determination by use of a dual platinum electrode." *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. p. 111. *Rpt. of Ont. Grape and Wine Res. Comm.* pp. A12-A13.

Edinger, W.D., Fisher, K.H., Barkovic, J. and Holman,L.L., 1985. Abstr. "Evaluation of new grape varieties for use in wine production." *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. p. 111. *Rpt. of Ont. Grape and Wine Res. Comm.* p. A12.

Edinger, W.D., Fuleki, T., Fisher, K.H., Palaby, R.B., Holman, L.L., and Jackson, K.M., 1985. Abstr. "Pre-harvest analysis of wine grape crop." *Rpt. of Ont. Grape and Wine Res. Comm.* p. A14.

Edinger, W.D., Holman, L.L., and Jackson, K.M., 1985. Abstrs. in *Rpt. of Ont. Grape and Wine Res. Comm.* "Development of methods for reducing the use of sulfites in winemaking." p. A14. "Heating of white wines to enhance flavor development." p. A12. "Use of carbonic maceration for red wine production." p. A13.

Elfving, D.C., 1985. Abstrs. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Control growth and stimulation of cropping in young 'Northern Spy' apple trees." p. 115. "Effect of flower of origin and hand pollination on fruit-quality parameters in 'Delicious'." p. 116. "Effect of supplemental Alar or Alar-Ethrel applications on flowering of Promalin (P) or 6-benziladenine (BA)-treated apple trees." p. 115. "Effect of trickle irrigation on yield and fruit-quality of 'McIntosh' and 'Delicious' ." p. 115. "Effects of foliar applications of Alar and Paclobutrazol (PP333) on growth and productivity of young 'Macspur

McIntosh' apple trees." p. 115. "Effects of nitrogen (N) and chemical thinning on growth and productivity of spur 'Delicious' apple trees." p. 116. "Effects of summer pruning with ot without Alar and Ethrel applications on 'Northern Spy' apple trees." pp. 116-117. "Effects of various size-controlling rootstocks on 'Starkspur Supreme Delicious'." p. 116. "Inhibition of flower-bud formation in cropping apple trees." p. 116.

Elfving, D.C., 1985. "Comparison of cytokinin and apical-dominance-inhibiting growth regulators for lateral-branch induction in nursery and orchard apple trees." *J. Hort. Sci.* 60(4): 447-454.

Elfving, D.C., 1985. "Control of apple tree growth - The root of the problem." Highlights of agric. res. in Ont. 8(4): 1-3.

Elfving, D.C., 1985. "Determining Alar dosage for apple orchards." *The Grower.* 35(8): 7, 15.

Elfving, D.C., 1985. "El cultivo de la manzana en Dalian, China." *Horticultura Moderna.* 1:13-15.

Fisher, K.H., 1985. Abstr. "Monitoring crop weight in De Chaunac grapevines." *Rpt. of Ont. Grape and Wine Res. Comm.* p. A1.

Fisher, K.H. and Barkovic, J., Abstrs. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Grapevine rootstock studies." p. 107. "Growth regulator studies in grapevines." p. 107. "Training and pruning systems for grapevines." p. 107.

Fisher, K.H. and Barkovic, J., 1985. "Grapevine rootstock studies." *Rpt. of Ont. Grape and Wine Res. Comm.* pp. A4-A6.

Fisher, K.H. and Barkovic, J., 1985. "Growth regulator studies in grapevines." *Rpt. of Ont. Grape and Wine Res. Comm.* pp. A7-A8.

Fisher, K.H. and Barkovic, J., 1985. "Training and pruning systems for grape vines." *Rpt. of Ont. Grape and Wine Res. Comm.* pp. A2-A3.

Fuleki, T., 1985. "Color sells fruits and vegetables." *Newsl. Can. Soc. Color. Art. Ind. Sci.* 12(4): 3-4.

Fuleki, T., 1985. Abstr. "Determining the varietal content of red grape juice concentrate on the basis of its anthocyanin pigment pattern produced by HPLC." *Rpt. of Ont. Grape and Wine Res. Comm.* p. A18.

Fuleki, T. and Duggan, M., 1985. Abstr. "Development of a quantatative method for the analysis of organic acids in grape, wine and juice using HPLC." *Rpt. of Ont. Grape and Wine Res. Comm.* p. A18.

Fuleki, T. and Palaby, R.B., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Juice potential of commercial grape cultivars." p. 108. "Suitability of some commercial grape cultivars for production of carbonated juice." p. 109.

Fuleki, T. and Palaby, R.B., 1985. Abstrs. in *Rpt. on Ont. Grape and Wine Res. Comm.* "Juice potential of commercial grape cultivars." p. A17. "Pre-harvest pigment analyses of grapes." p. A15. "Suitability of some commercial grape cultivars for production of carbonated juice." p. A15.

Fuleki, T., Palabay, R.B., and Okanik, W.J., 1985. Abstr. "Grape juice tasting and seminar." *Rpt. of Ont. Grape and Wine Res. Comm.* p. A16.

Giesbrecht, R.J., Fuleki, T. and Duitschaever, C.L., 1985. Abstr. "Decolorization of De Chaunac wine by membrane processes." *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. p. 108. *Rpt. of Ont. Grape and Wine Res. Comm.* p. A17.

Giesbrecht, R.J., Fuleki, T. and Duitschaever, C.L., 1985. "Ultrafiltration and reverse osmosis as a means of De Chaunac decolorization." *Eastern Grape Grower and Winery News.* 11(4): 38-39.

Gonzalez, J.E. and Chong, C., 1985. Abstr. "Salt tolerance and mineral nutrient status of cuttings of five ornamental species rooted in medium amended with Osmocte." *HortSci.* 20:184.

Gray, V., 1985. Abstr. "Ontario Wine Standards Tasting Panel evaluation of commercial wines." *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. p. 109. *Rpt. of Ont. Grape and Wine Res. Comm.* p. A19.

Hamersma, B., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Evaluation on annuals, herbaceous perennials and woody ornamentals." pp. 106-107.

Ingratta, F.J. and Straver, W.A., 1985. Abstrs. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Greenhouse sweet peppers." p. 104. "Greenhouse tomato cultivar trials." p. 103. "Greenhouse tomato management." p. 104. "Substrate growing of seedless cucumbers." p. 104.

Knibbe, E.N. and Valk, M., 1985. Abstrs. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Celery storage environment trial." p. 118. "Effect of herbicides on buckwheat used for wind abatement in carrots grown in organic soil, 1984." p.117.

Knibbe, E.N., Valk, M., and Burbridge, H., 1985. Abstrs. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Broccoli cultivar trial on organic soil, 1985." p. 119. "Cabbage storage types and cultivar trial." p. 119. "Carrot cultivar storage trial." p. 118. "Celery storage duration trial." p. 118. "Long term average results of onion storage trials." p. 119. "Seed stalk development of celery cultivars." p. 119. "Transplanted cauliflower herbicide trial on organic soil." p. 120.

Lauro, E.M., 1985. "Trends in harvest mechanization." *The Grower.* 35(12): 19-20.

Lauro, E.M., Chu, C.L., and Smith, R.B., 1985. "Emphasize improved storage of fruit crops in Ontario." *Can. Fruitgrower.* 41(9): 18-19.

Lauro, E.M., Gray, V.P., Dale, A., and Hergert, G.B., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Technical and economic evaluation of a mechanical strawberry harvesting system." p. 110.

Lauro, E.M., Wismer, J.D. and Chu, C.L., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Development of a temperature monitor and computer controlled alarm system for cold storage facilities." pp. 109-110.

Loughton, A., 1985. "A case for broccoli." *Highlights of agri. res. Ont.* 8(2): 17-20.

Loughton, A., 1985. "Closer spacing of asparagus advised." *Brantford Expositor.* April 9. p. 19.

Loughton, A., 1985. "The Horticultural Experiment Station, Simcoe, Ontario." *Can. Soc. Hort. Sci. Newsl.* Sept. pp. 1-3.

Loughton, A. and Baker, R., 1985. Abstrs. in *Can. Asparagus Res. Rpt. 1984-85.*
"Asparagus cultivar trial I, established 1979." p. 63. "Asparagus cultivar trial II, established 1980." p. 64. "Asparagus depth of planting x row widths." p. 66. "Asparagus: methods of plant establishment 1984." p. 65.

Loughton, A. and Baker, R., 1985. Abstrs. in the *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Asparagus cultivar testing." p. 115. "Cole crop cultivar trials." p. 114. "Comparison of methods of asparagus plant establishment." p. 114. "Effects of planting depth x rows on asparagus production." p. 114.

McKeown, A.W. and Reynolds, L.A., 1985. Abstrs. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Effect of bud position on tubers of 'Jemseg' and 'Superior' on emergence, bulking rate and yield." pp. 113-114. "Evaluation of strip tillage into fall-sown rye for production of machine harvested tomatoes." p. 114.

McKeown, A.W., Reynolds, L.A. and Wang, S.L., 1985. "Response of H2653 tomatoes to levels of nitrogen." *Rpt. of Ont. Tomato Res. Comm.* p. 21.

McKeown, A.W., Reynolds, L.A., O'Sullivan, J., and Bouw, W.J., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Sensitivity of 'Shepody' and 'Superior' potatoes to Metribuzin." p. 114.

Miles, N.W., 1985. "Peach thinning - a must for 1985." *Niagara Peninsula Spray Service and Fruit Info. Newsl.* No. 4. pp. 8-9.

Miles, N.W., 1985. "Peach varieties for Niagara." *Niagara Peninsula Spray Service and Fruit Info. Newsl.* No. 3. P. 6.

Miles, N.W., 1985. "Protected fruit culture." *Highlights agric. res. Ont.* 8(2):25.

Miles, N.W. and Slingerland, K., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Growing peaches under plastic." p. 108.

Miles, N.W., Biggs, A.R., and Slingerland, K., 1985. Abstr. in *Rpt. of. Comm. on Hort. Res.* Can. Hort. Council. "Peach breeding." p. 107.

O'Sullivan, J., 1985. "Amitrole best way to control field horsetail." *Brantford Expositor.* April 9, p. 19.

O'Sullivan, J. and Bouw, W.J., 1985. Abstrs. in *Exp. Comm. on Weeds, Res. Rpt.: East Sec.* "Beet tolerance to sethoxydim and fluazifop-butyl." p. 426. "Cabbage tolerance to sethoxydim and fluazifop-butyl." p. 438. "Carrot tolerance to sethoxydim and fluazifop-butyl." p. 434. Cauliflower tolerance to sethoxydim and fluazifop-butyl." p. 438.

"Cucumber tolerance to sethoxydim and fluazifop-butyl." p. 646. "Lima bean tolerance to sethoxydim and fluazifop-butyl." p. 307. "Herbicides for night shade control." p. 518. "Pea tolerance to sethoxydim and fluazifop-butyl." p. 457. "Pepper tolerance to sethoxydim and fluazifop-butyl." p. 647. "Potato tolerance to metribuzin." p. 399. "Pumpkin tolerance to sethoxydim and fluazifop-butyl." p. 647. "Snap bean tolerance to sethoxydim and fluazifop-butyl." p. 307. "Squash tolerance to sethoxydim and fluazifop-butyl." p. 646. "Tomato tolerance to sethoxydim and fluazifop-butyl." p. 353. "Weed control in asparagus crowns." p. 419. "Weed control in cucumbers." p. 642. "Weed control in direct seeded tomatoes." p. 352. "Weed control in established asparagus." p. 423. "Weed control in garlic." p. 442. "Weed control in peppers." p. 645. "Weed control in strawberries." p. 472. "Weed control in sweet corn I." p. 153. "Weed control in sweet corn II." p. 154. "Weed control in sweet corn III." p. 155. "Weed control in transplant broccoli." p. 437. "Weed control in transplant tomatoes." p. 351.

O'Sullivan, J. and Bouw, W.J., 1985. Abstrs. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Effect of date of seeding on yield of cucumbers." p. 113. "Effect of raised beds on cucumber yield." p. 113. "Evaluation of processing cucumber cultivars." p. 113. "Muskmelon cultivar evaluation." p. 113. "Pepper cultivar evaluation." p. 113. "Response of cucumbers to trellising." p. 113.

O'Sullivan, J., McKeown, A., Reynolds, L., and Bouw, W.J., 1985. Abstr. "Potato tolerance to metribuzin." *Exp. Comm. on Weeds, Res. Rpt.: East. Sec.* p. 399.

Piedrahita, O. and Chong, C., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Prevention of salt-spray injury to trees." p. 106.

Piedrahita, O., Ellis, C.R. and Bogart, J.P., 1985. "Electrophonetic identification of the larvae of *Diabrotica barberi* and *D. virgifera virgifera (Coleoptera: Chrysomelidae)*." *Ann. Entomol. Soc. Am.* 78:537-540.

Poysa, V.W., Garton, R., Courtney, W.H., Metcalf, J.G. and Meuhmer, J., 1986. "Genotype-environment interactions in processing tomatoes in Ontario." *J. Amer. Soc. Hort. Sci.* 111:293-297.

Rinker, D.L., 1985. "The mushroom industry in Canada." *The Grower.* 35(7): 24, 27.

Rinker, D.L., 1985. "Third generation insecticides in the mushroom industry." *The Grower.* 35(9): 12-13, 16.

Rinker, D.L., Alm, G., and Mancini,L., 1985. Abstrs. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Yield response of mushrooms to Nutricote." p. 104. "Yield response of the cultivated white button mushroom to nutritional supplement." p. 104.

Rinker, D.L. and Dodsworth, C., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Determination of Permethrin residues in mushrooms." p. 105.

Rinker, D.L. and Mancini, L., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Use of Dimilin in mushroom casing for sciarid control." pp. 104-105.

Rinker, D.L. and Tetrault, R., 1985. "Mushroom sciarid control with cyromazine (Armor)." *Insecticide and Acaricide Tests.* 10:116.

Rinker, D.L. and Tetrault, R., 1985. "Mushroom sciarid control with diflubenzuron (Dimilin)." *Insecticide and Acaricide Tests.* 10:117.

Smith, A.W., 1986. "A man I never met." *Rhododendron Soc. of Can. Bull.* 15(1):11-13.

Smith, A.W., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Rhododendron breeding." p. 107.

Smith, A.W., 1985. Abstrs. "Vinebelle." "Vinecrest." Vinemount." "Vinerouge." *Jr. Am. Rhododendron Soc.* 39(4):232-233.

Smith, A.W., 1986. "Breeding rhododendrons and azaleas." *Landscape Ont.* 14(1):9

Smith, R.B., 1985. "Predicting the dates of first commercial harvest of selected Ontario peach cultivars." *J. Am. Soc. Hort. Sci.* 110(5):650-654.

Smith, R.B. and Skog, L., 1985. Abstr. "Storage research trials with Ontario-grown dessert grapes." *Rpt. of Ont. Grape and Wine Res. Comm.* p. A20.

Smith, R.B. and Skog, L., 1985. Abstrs. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Controlled atmosphere storage of cauliflower." p. 109. "Storage research trials with Ontario-grown dessert grapes." p. 109.

Tehrani, G., 1985. "Pear industry geared to expand." *Can. Fruitgrower.* 41(6):5-6.

Tehrani, G. and Alden, W.R., 1985. "The fruit tree superior stock program: A service for avoiding serious losses." *The Grower.* 35(10):10-12.

Tehrani, G. and Allen, W.R., 1985. "The fruit tree superior stock program." *Highlights of agric. res. in Ont.* 8(3):1-5.

Tehrani, G. and Lay, J.W., 1985. Abstr. "Distribution of budwood from superior stock program." *Stone Fruit Comm. Ann. Rpt.* unpaginated.

Tehrani, G. and Leuty, S.J., 1985. Abstr. "The influence of rootstock and pruning on yield, growth and fruit size of European plum cultivars." *Stone Fruit Comm. Ann. Rpt.* unpaginated.

Tehrani, G., Barkovic, J., Lay, J.M., and Slingerland, K., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Hort. Council. "Distribution of budwood from superior stock program." p. 108.

Valk, M. and Knibbe, E.N., 1985. Abstrs. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Cultivar trials on organic soil." p. 118. "Phosphate rate study on onions grown on muck soils." p. 117.

Valk, M., Knibbe, E.N., and Burbridge, H., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Fungicide treatments for the control of cavity spot and horizontal lesions in carrots." pp. 119-120.

Valk, M., Knibbe, E.N. and Elliott, R., 1986. "Controlling subsidence of organic soils." *Highlights of agric. res. in Ont.* 9(1):12-15.

Valk, M., Knibbe, E.N., Elliott, R., and Irwin, R.W., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Reducing subsidence at the Muck Research Station by water table control." p. 117.

Wang, S.L., 1986. "Food Processing - Adding value to raw commodities." *The Grower.* 36(1):18.

Wang, S.L., 1985. "Processing tomatoes - A bright future." *The Grower.* 35(6):9,10.

Wang, S.L. and Ridrick, I.L., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "I.Q.F. quality of small fruits." p. 111.

Wang, S.L., Courtney, W.A., and Rodrick, I.L., 1985. Abstr. in *Rpt. of Comm. on Hort. Res.* Can. Hort. Council. "Evaluation of tomato solids and paste consistency." p. 110.

Warner, J., Tehrani, G. and Lay, J.W., 1985. "Performance of European plum cultivars on different rootstocks at Brighton, Ontario." *Smithfield News.* Nov. 5, p. 6.

PROCEEDINGS

Blom, T.J., 1985. "Lighting aspects for containerized tree seedlings." *B.C. Nurs. Assn. Mtg.*, Duncan, B.C. 11 pp.

Blom, T.J., 1985. "New developments in polyethylene films." *Can. Greenhouse Conf.* Guelph. 7 pp.

Chudyk, R.V., 1985. "Yeasts in bottled wines." *Proc. Wine Industry Workshop*, Cornell University, NYSAES, Geneva, N.Y. April. pp. 15-16.

Cline, R.A., 1985. "Do you understand your trees' nutritional needs?" *Mich. State Hort. Soc. Ann. Rpt.* 115:78-81.

Cline, R.A., 1985. "Soil management and irrigation effects on peach canker in the Niagara Peninsula of Ontario." *1984 Stone fruit Tree Decline Workshop Proc.* Kalamazoo, MI. Oct.-Nov. pp 71-76.

Cline, R.A., Fisher, K.H., and Bradt, O.A., 1985. "The effects of trickle irrigation and training system on the performance of Concord grapes." *Proc. Third Intl. Drip/Trickle Irrigation Congress.* Fresno, CA. November 18-21. pp. 220-231.

Dale, A., 1985. "Developments with solid bed culture and mechanical harvesting and processing." Proc. Symp. sur la culture de la fraise. Quebec. pp. 197-208.

Daigneault, L. and Chong, C., 1985. Abstr. "Rooting activity of willow extracts." *Proc. Can. Soc. Hort. Sci. 24:47.*

Edinger, W.D., 1985. "Working with malolactic fermentation." *Proc. Wine Industry Workshop*, Cornell University, NYSAES, Geneva, N.Y. April. pp. 17-22.

Elfving, D.C., 1985. "Apple production in Canada." *Proc. N.Y. State Hort. Soc.* 130:177-183.

Elfving, D.C., 1985. "Managing existing orchards for quality production." *Proc. N.Y. State Hort. Soc.* 130:183-188.

Elfving, D.C. and Proctor, J.T.A., 1985. Abstr. "Effects of Paclobutrazol (PP333) on apple-tree shoot growth, yield and fruit-leaf relationships." *Growth Regulators in Fruit Production* (5th International Symposium, Rimini, Italy. Sept. pp. 84-85.

Fuleki, T. and Somerville, 1985. "Separation of anthocyanins of Concord grapes by high performance liquid chromatography." *Proc. Polyphenols Intl. Conf.* Plovdiv, Bulgaria. May-June pp. 506-512.

Giesbrecht, R.J., Fuleki, T. and Duitschaever, C.L., 1985. Abstr. "Decolorization of De Chaunac wine by membrane processes." *Am. Soc. Enol. Vitic. Ann. Mtg.* Reno, Nevada. June p. 6.

Lauro, E.M., Chu, C.L., and Smith, R.B., 1985. "Research facilities for improved storage of fruit and vegetable crops." Paper No. 85-414, *AIC. Can. Soc. of Agric. Engng. Conf.* Charlottetown, P.E.I., June. 17 pp.

Loughton, A. and Baker, R., 1985. "The effect of depth of direct-seeding on asparagus." *Proc. 6th Intl. Asparagus Symp.* Guelph. Aug. p. 35.

Loughton, A. and Riekels, J.W., 1985. Abstr. "Cultivar and nutritional aspects of black speck in cauliflower curds." *Proc. Ca. Hort. Sci.* 24:45.

Miles, N.W., 1986. "Greenhouse kiwifruit culture." *1986 Kiwifruit Production Mtg. Proc.*, Saanichton, B.C. Jan. pp. 15-16.

Miles, N.W. and Leuty, S., 1985. Abstr. "Peach tree density and training systems affect productivity and gross margins." *Proc. ASHS Ann. Mtg. HortSci.* 20(3):528.

Miles, N.W. and Leuty, S., 1985. Abstr. "Protected peach culture: Training systems and production costs related to field-grown trees." *Proc. ASHS Ann. Mtg. HortSci.* 20(3):573.

O'Sullivan, J. and Bouw, W.J., 1985. Abstr. "Control of field horsetail (*Equisetum arvense L.*) in asparagus." *Proc. 6th Intl. Asparagus Symp.* Guelph. Aug. p. 38.

BOOKS, THESES, REPORTS

Blom, T.J. and Piott, B.D., 1985. *Cultivar and supplemental lighting trial of roses.* Flowers Canada, Cecil Delworth Foundation. Final Rpt. 8 pp.

Blom, T.J. and Piott, B.D., 1986. *The effects of controlled soil temperatures on the production of Alstroemerias.* Flowers Canada, Cecil Delworth Foundation. Progress Rpt. No. 1 7 pp.

Chu, C.L., 1985. *Annual report on apple storage research.* HPL Res. Rpt. HRIO Vineland. 22 pp.

Chu, C.L., 1985. *Progress of work and principal accomplishments.* Rpt. for Ann. Rpt. of NE-103 U.S.D.A. Tech. Comm. for Postharvest Physiology of Fruits. 1 p.

Chu, C.L., Smith, R.B. and Lauro, E.M., 1985. "New CA storage research facilities at the Horticultural Research Institute of Ontario." In: *Controlled Atmospheres for Storage and Transport of Perishable Agricultural Commodities.* Ed. S.M. Blankenship. North Carolina State Univ. pp. 229-234.

Chong, C., 1985. *Propagation of fruit and ornamental nursery stocks.* Final Rpt. to Gouvernement du Quebec, Ministere de l'Agriculture des Pecheries et de l'Alimentation. Project MCA-82-943. 19 pp.

Courtney, W.H. and Banfield, G.E., 1985. *Processing toamtoes — Breeding and cultivar trials.* Res. Rpt. No. 80, Hort. Exp. Stn., Simcoe.

Dale, A., 1985. Editor. *1984 Ann. Res. Rpt. of the Processing Strawberry Res. Corp. for the Project Establishing a Processing Strawberry Industry.* 111 pp.

Dale, A., 1985. Rpts. in *1984 Ann. Res. Rpt. of the Processing Strawberry Res. Corp. for the Project Establishing a Processing Strawberry Industry.* April. "Guidelines for solid bed strawberry culture." pp. 94-97. "Production research." pp. 7-16.

Edinger, W.D., 1985. *Identification and characterization of lactic acid bacteria isolated from grapes and wine, and their interactions with sorbic acid.* Ph.D. thesis, Cornell University, Ithaca, Jan.

Elfving, D.C. and Pierce, W.F., 1985. *SIGNAL — Apple trials 1985.* Res. Rpt. No. 17. Hort. Exp. Stn., Simcoe. 37 pp.

Elfving, D.C., Dale, A., Fisher, K.H., Miles, N. and Tehrani, G., 1985. *Fruit cultivars — A guide for commercial growers.* (Rev.) OMAF Publication 430. 82 pp.

Fuleki, T., 1985. "Juice making research — 1984." In *1984 Ann. Res. Rpt. of the Processing Strawberry Res. Corp. for the Project Establishing a Processing Strawberry Industry.* April. pp. 78-79.

Gray, V.P., 1985. "Processing research." In *1984 Ann. Res. Rpt. of the Processing Strawberry Res. Corp. for the Project Establishing a Processing Strawberry Industry.* April. pp. 47-77.

Hamersma, B. and Chong, C., 1985. *Broad-leaved evergreens for the home garden.* (Rev.) OMAF Factsheet. Dec.

Ingratta, F.J., Blom, T.J. and Straver, W.A., 1985. "Canada: Current Research and developments." *Hydroponics Worldwide: State of the Art in Soilless Crop Production.* Ed. A.J. Savage. Honolulu: Intl. Center for Special Studies. pp. 95-102.

Lauro, E.M., 1985. "Machinery and equipment." In *1984 Ann. Res. Rpt. of the Processing Strawberry Res. Corp. for the Project Establishing a Processing Strawberry Industry.* April. pp. 29-46.

Lauro, E.M., Wismer, J.D., and Chu, C.L., 1985. *Development of a temperature monitor and computer controlled alarm system for cold storage facilities.* HPL Tech. Rpt., H.R.I.O., Vineland, Dec. 1985. 11 pp.

Loughton, A., 1985. "Rhubarb." *The Canadian Encyclopedia.* Ed. J.H. Marsh. Edmonton: Hurtig Publishers Ltd. p. 1582.

Loughton, A., Baker, R., O'Sullivan, J. and Bouw, W., 1985. *Asparagus Report 1985.* Res. Rpt. No. 76, Hort. Exp. Stn., Simcoe. 9 pp.

Loughton, A., Baker, R., O'Sullivan, J., Bouw, W.M., McKeown, A.W. and Reynolds, L.A., 1985. *Vegetable Cultivar Trials, 1985.* Res. Rpt. No. 79, Hort. Exp. Stn., Simcoe. 54 pp.

McKeown, A., Coffin, R. and Squire, S., 1986. *Jemseg.* OMAF Factsheet. Jan.

McKeown, A., Coffin, R., and Squire, S., 1986. *Yukon Gold.* OMAF Factsheet. Jan.

O'Sullivan, J., 1985. "Weed control." In *1984 Ann. Res. Rpt. of the Processing Strawberry Res. Corp. for the Project Establishing a Processing Strawberry Industry.* April. pp. 17-18.

O'Sullivan, J. and Bouw, W.J., 1985. *Herbicide research report.* Res. Rpt. No. 77. Hort. Exp. Stn. Simcoe. Nov. 32 pp.

O'Sullivan, J. and Bouw, W.J., 1985. *Pickling cucumber, muskmelon — pepper cultivar trials.* Res. Rpt. No. 81. Hort. Exp. Stn. Simcoe. Dec. 21 pp.

Piedrahita, O., 1985. *Prevention of salt-spray injury to fruit trees. Interim Report 1984-85.* Tech. Rpt. HRIO, Vineland. 54 pp.

Smith, R.B., 1985. "Storage research." In *1984 Ann. Res. Rpt. of the Processing Strawberry Res. Corp. for the Project Establishing a Processing Strawberry Industry.* April. pp. 80-89.

Tehrani, G., 1985. "Plum." *The Canadian Encyclopedia.* Ed. J.H. Marsh. Edmonton: Hurtig Publishers Ltd. p. 1430.

Tehrani, G., Fisher, K.H., Miles, N.W., 1985. *Stone fruit varieities for the home garden.* (Rev.) OMAF Factsheet. Dec.

Valk, M., Knibbe, E., Burbidge, H., and Flinn, P., 1985. *Muck vegetable cultivar trials and research reports 1985.* Res. Rpt. No. 35. Muck Res. Stn. Kettleby. 42 pp.

Wang, S.L., 1985. *A collaborative study on the determination of total solids with a microwave solids analyser.* HPL Tech. Rpt. HRIO, Vineland. 1 p.

Wang, S.L., 1985. Rpts. presented at Sym. on Tomato Processing., Chung Shiu Univ. Taichung, Taiwan. June. *Formulation of tomato products from paste.* 6 pp. *Marketing of tomato sauces.* 6 pp. *New product development.* 6 pp. *Processing of spaghetti sauce.* 6 pp. *Processing of tomato catsup.* 6 pp.

Wang, S.L. and Rodrick, I.L., 1985. *Evaluation of tomato paste consistency.* HPL Tech. Rpt. HRIO, Vineland. 1 p.

Wang, S.L., Courtney, W.A., and Rodrick, I.L., 1985. *A rapid method for screening tomato cultivars for high solids and paste consistency.* HPL. Tech. Rpt. HRIO, Vineland. 1 p.

NEW LISKEARD COLLEGE OF AGRICULTURAL TECHNOLOGY

PUBLICATIONS

Periodicals

Garland, G.A., 1986. "Filter Mat Prevent Mud Holes From Growing." *OMAF News*, January.

Hughes, B.R., 1986. "Demand for Cole Crops in the North Can Be Met By Local Growers." *OMAF News*, March.

MacLaren, L.A., 1985. "NLCAT Sheep Flock Facilities and Research Program." May.

McLaren, L.A., 1985. "A Unique Test Station for Rams — On Pasture." *Sheep Canada* 10(3) p. 18.

Pollock, W.E., Proulx, J.G., 1986. "Finishing Beef on Silage in Northern Ontario" *Highlights, agri. res. Ont.* 9(1): 4-7.

Skepasts, A.V., 1985. "Intensive Barley Management in North Eastern Ontario" *Highlights, agri. res. Ont.* 8(4): 14-17.

Proceedings

Gumprich, P.S., 1986. "Tingle Voltage, Is It A Problem?" *Proc. North Eastern Ont. Agr. Conf.*, March.

Hope, D.G., 1986. "What the Heck is Basis?" *Proc. North Eastern Ontario Agr. Conf.*, March.

Hope, D.G., 1986. "Following the Markets." *Proc. North Eastern Ontario Agr. Conf.* March.

Kirik, M., 1986. "Silo Insulation — Survey Results." *Proc. North Eastern Ont. Agr. Conf.*, March.

Rowsell, J.G., 1986. "Feeding the Plants." *Proc. North Eastern Ont. Agr. Conf.*, March.

Skepasts, A.V., 1986. "Varieties From the West." *Proc. North Eastern Ont. Agr. Conf.*, March.

Books, Theses, Reports

Skepasts, A.V., 1985. "*CropCheck North Annual Report.*" November.

Skepasts, A.V., Taylor, D.W. and Bowman, G.T., 1986. "Alfalfa Seed Production in Temiskaming District." *NORDA Report, March.*

Video Productions

Rowsell, J.G. and Gambles, G.H., 1985. *Leafcutter Bee Management for Alfalfa Seed Productions in Northern Ontario.* Northern Ontario Agricultural Resource Center (NOARC).

Rowsell, J.G. and Gambles, G.H., 1985. *Pasture Management in Northern Ontario*, NOARC.

Rowsell, J.G. and Gambles, G.H., 1985. *Quality Forage for Beef*, NOARC.

Slide-Tape Audio Visuals

Gambles, G.H. and Rowsell, J.G., 1985. *Barn Ventilation in Northern Ontario.* NOARC.

Gambles, G.H. and Rowsell, J.G., 1985. *Canola Production in Temiskaming*, NOARC.

Gambles, G.H. and Rowsell, J.G., 1985. *Commercial Wild Lowbush Blueberry Production in Northern Ontario.* NOARC.

Gambles, G.H. and Rowsell, J.G., 1985. *Forage Storage Options for Northern Ontario.* NOARC.

Gambles, G.H. and Rowsell, J.G., 1985. *Predator Control Fencing*, NOARC.

Gambles, G.H. and Rowsell, J.G., 1985. *Pole Building Construction.* NOARC.

Gambles, G.H. and Rowsell, J.G., 1985. *Water Table Control for Organic Soils.* NOARC.

RIDGETOWN COLLEGE OF AGRICULTURAL TECHNOLOGY

PERIODICALS

Ablett, G.R., 1985. *USDA Uniform Soybean Tests, Northern States*, Uniform I, pp. 69-88.

Ablett, G.R., 1985. Tables 1 and 2, *1986 Report Ontario Soybean Variety Trials.*

Brown, R.H. and Swanton, C.J., 1986. *Abstrs. in Expert Comm. on Weeds Res. Rpt., Eastern Section, 1985.* "Alachlor-Dicamba for Weed Control in Field Corn XVI." p. 102. "Bromoxynil for Postemergence Weed Control in Field Corn XVII." p. 103. "Dicamba/Atrazine Premix for Weed Control in Field Corn IV." p. 90. "Dicamba Formulations in Weed Control Programs for Field Corn XV." p. 101. "Directed Postemergence Herbicides for Weed Control in Field Corn X." p. 96. "Early Postemergence Herbicides for Weed Control in Field Corn II." p. 88. "Fluroxypyr For Broadleaf Weed Control in Field Corn IX." p. 95. "Herbicide Combinations for Weed Control in Field Corn III." p. 89. "Herbicide Combinations for Weed Control in Transplanted Peppers II." p. 644. "Herbicides for Broadleaf Weed Control in Field Corn XI." p. 97. "Herbicides for Weed Control in Alfalfa I." p. 33a. "Herbicides for Weed Control in Alfalfa II." p. 33a. "Herbicides for Weed Control in Field Corn I." p. 87. "Herbicides for Weed Control in Field Corn V." p. 91. "Herbicides for Weed Control in Field Corn XIII." p. 99. "Herbicides for Weed Control in No-Till Corn I." p. 157. "Herbicides for Weed Control in No-Till Corn II." p. 158. "Herbicides for Weed Control in Peas I." p. 460. "Herbicides for Weed Control in Potatos II." p. 411. "Herbicides for Weed Control in Soybeans I." p. 268. "Herbicides for Weed Control in Soybeans II." p. 269. "Herbicides for Weed Control in Soybeans III." p. 270. "Herbicides for Weed Control in Soybeans IV." p. 271. "Herbicides for Weed Control in Soybeans V." p. 272. "Herbicides for Weed Control in Soybeans VI." p. 273. "Herbicides for Weed Control in Soybeans VII." p. 274. "Herbicides for Weed Control in Soybeans VIII." p. 275. "Herbicides for Weed Control in Soybeans IX." p. 276. "Herbicides for Weed Control in Soybeans X." p. 277. "Herbicides for Weed Control in Soybeans XI." p. 278. "Herbicides for Weed Control in Velvetleaf I." p. 519. "Herbicides for Weed Control in Winter Wheat I." p. 80a. Herbicides for Weed Control in Winter Wheat II." p. 80b. "Herbicides for Weed Control in Winter Wheat III." p. 80c. "Herbicides for Weed Control in Winter Wheat IV." p. 80b. "Herbicides for Weed Control on Ridge Tilled Soybeans I." p. 281. "Herbicides for Weed Control on Ridge Tilled Soybeans II." p. 282. "Metribuzin for Weed Control in Field Corn XIV." p. 100. "Herbicide Programs for Weed Control in Transplanted Tomatoes II." p. 339. "Metribuzin X Tomato Varieties Tolerance Trial." p. 341. "New Herbicides for Weed Control in Field Corn XII." p. 98. "No-Till Weed Control in No-Till Soybeans I." p. 279. "Postemergence Weed Control in Transplanted Tomatoes III." p. 340. "Preplant Incorporated Herbicides for Weed Control in Field Corn VI." "Preplant Incorporated Herbicides for Weed Control in Transplanted Peppers." p. 643. "Sensitivity of Shepody Potatoes to Metribuzin I." p. 410. "Summary, Soybeans and Peanuts." p. 159. "Summary, Tomatoes." p. 336. "Summary, Turf." p. 481. "Tank-Mix vs. Formulated Herbicides for Weed Control in Field Corn VII." p. 93. "Weed Control in Field Corn VIII." p. 94. "Weed Control in No-Till Soybeans II." p. 280. "Weed Control in Transplanted Tomatoes I." p. 338.

Brown, R.H., 1986. *Abstrs. in "Ontario Tomato Research Projects, 1985."* "Herbicides for Weed Control in Transplanted Tomatoes II." p. 32. "Postemergence Weed Control in Transplanted Tomatoes III." p. 33. "Weed Control in Transplanted Tomatoes I." p. 31.

Brown, R.H., 1986. "New for '86 in 75." *Beans in Canada*, Vol. 12, No. 4, p. 26.

Brown, R.H., 1986. "1986 Weed Control." *Corn in Canada*, Vol. 12, No. 3, p. 45.

Doidge, B.R., 1985. "Current Status of the 1985 Farm Bill." *Market Update* 57:5-6

Doidge, B.R., 1985. "Seasonal Patterns in Corn Prices." *Ontario Corn Producer* 1(2):30-31.

Doidge, B.R., 1985. "Market Trends." *Ontario Corn Producer* 1(2):20-21.

Doidge, B.R., 1985. "Agricultural Options for Corn Producers." *Ontario Corn Producer* 1(3):4-5.

Doidge, B.R., 1985. "Market Trends." *Ontario Corn Producer* 1(3):9.

Doidge, B.R., 1985. "More on Options for Corn Producers." *Ontario Corn Producer* 1(4):4-5.

Doidge, B.R., 1985. "Market Trends." *Ontario Corn Producer* 1(4):9-10.

Doidge, B.R., 1985. "Using Options to Manage Your Corn Marketing." *Ontario Corn Producer* 1(5):16-19.

Doidge, B.R., 1985. "Market Trends." *Ontario Corn Producer* 1(5):8-13.

Doidge, B.R., 1985. "Ontario Cash Corn Price Ratios." *Ontario Corn Producer* 1(6):9-10.

Doidge, B.R., 1985. "Market Trends." *Ontario Corn Producer* 1(6):18-19.

Doidge, B.R., 1985. "Using Futures to Make Storage Decisions." *Ontario Corn Producer* 1(7):8-9.

Doidge, B.R., "Market Trends." *Ontario Corn Producer* 1(7):19.

Doidge, B.R., 1985. "Minimum Pricing Contracts." *Ontario Corn Producer* 1(8):3-20.

Doidge, B.R., 1985. "Market Trends." *Ontario Corn Producer* 1(8):8.

Doidge, B.R., 1986. "U.S. Agricultural Policy." *Ontario Corn Producer* 1(9):4-6.

Doidge, B.R., 1986. "Market Trends." Ontario Corn Producer 1(9):11-14.

Doidge, B.R., 1986. "Marketing: Part of the Management Process." *Ontario Corn Producer* 1(10):24-25.

Doidge, B.R., 1986. "Market Trends." *Ontario Corn Producer* 1(10):18-19.

Doidge, B.R., 1986. "Using Elevator Spreads." *Ontario Corn Producer* 1(11):6-7.

Doidge, B.R., 1986. "Market Trends." *Ontario Corn Producer* 1(11):22-23.

McLaren, A.D., 1985. "Alfalfa, White Clover, Orchard Grass, Yield Trials 1985." *Ontario Forage Crop Investigations 1985 Report on Field Trials of Varieties and Mixtures.* pp. 5, 11, 23, 27, 53, 64.

McLaren, A.D., 1985. Tables 5, 6 & 7. *Report of Hybrid Corn Performance Trials.*

Morris, J.R., 1986. "Roasted Soybeans for Market Pigs", "The Effect of Various Methods of Feeding on Performance and Profitability of Market Pigs" (pp. 72-73), "The Efficacy of a Commercial Chelated Mineral Diet for Nursing Sows", "The Efficacy of Norwegian Kelp Meal (Algit) in Swine Starter Diets", "Naked Oats — an Excellent Feed for Pigs" (pp. 76-86). *Ontario Swine Research Review OAC Publ. No. 186.*

Morris, J.R., 1985. "High Lysine Corn Chops Costs." *The Hog Market Place Quarterly.* Winter 1985-1986:30-32.

Morris, J.R., 1985. "High Lysine Corn Gets Top Rating." *The Hog Market Place Quarterly.* Summer 1985:41-43.

Morris, J.R., 1985. "Computer Programs for Swine", "Effects on Performance of Market Pigs Fed Diets Supplemented With Soybean Meal and Animal Tallow", "Relative Nutritional Worth for Various Feedstuffs", "Hi Lysine Corn for Growing-Finishing Pigs". *Ontario Pork Producers' Marketing Board Swine Research in Ontario - 1984.* pp. 71-87.

Muehmer, J.K., 1985. *Abstrs. in Ont. Tomato Research Committee Report.* "Effects of Cover Crops on Tomato Production Under Various Soil Conditions." pp. 12, 13. "Survival of Tomato Transplants After 4 Storage Periods Using Various Transplant Dips." p. 14. "Tomato Transplant Study Using Various Tank Mixes." p. 15. "Effect of RESPOND (Crop and Soil Supplement) on Tomato Growth and Yield." p. 16. "Comparing Various Tomato Starter Fertilizer Dips." p. 19. "Nutrient Distribution and Absorption in Tomato Transplants." pp. 20, 21. "Freshmarket Tomato Coordinated Trial." p. 67. "Screening of Additional Processing and Freshmarket Tomato cvs. for Southwestern Ontario." p. 68. "Northern Tomato Exchange Program (NTEP) Trials at RCAT." p. 68. "Selection of Suitable Lines From Simcoe/Ridgetown Breeding Material Under Southwestern Ontario Conditions." p. 69. "Ontario Coordinated Tomato Trials, RCAT." p. 76. "ADI Screening Plots at RCAT." p. 76. "Evaluation of Advanced Large Scale Wholepack Tomato Trial." p. 77. "Evaluation of Large Scale All Purpose, Advanced Tomato Trials." p. 78.

Muehmer, J.K., 1985. *Rept. of Low Acreage and Special Crops Committee*, Dec. 11, Guelph, No page #. "Southwestern Ontario Pepper Screening Trial." "Coordinated Pepper Cultivar Trial, RCAT." "Muskmelon Management Trial with Three cvs." "Leek Performance Trial, 1985." "Red Beet Screening Trial."

Pitblado, R.E., 1985. "Bacterial Canker in Field Tomatoes: Facts and Concerns." *Highlights, Agric. Res. Ont.* 8(2):11-13.

Pitblado, R.E., 1985. *Abstrs. in Ontario Tomato Res. Projects.* Ontario Tomato Committee. "Chemical Control of Bacterial Speck in Tomatoes." pp. 56-57. "Tomato Disease Control Using Soil Fumigants." pp. 58-59. "The Efficacy of Herbicide-Fungicide Tank Mixes in Tomatoes." pp. 54-55. "To Evaluate the Overwintering Capability and Subsequent Plant Infections of Bacterial Canker in Ontario and Georgian Soils." p. 60. "Tomato Fungicide Screening." pp. 52-53. "Weather-Timed Fungicide Spraying for Disease Control in Tomatoes I-Vb." pp. 40-51.

Pitblado, R.E., 1985. *Abstrs. in Exp. Comm. on Pesticide Use in Agric.* "Chemical Control of Bacterial Speck in Tomatoes." p. 282. "Chemical Control of Fungal Soil-Borne Potato Disease." p. 299. "Corn Rootworm Insecticide Evaluation — Comparison Between Two Application Techniques." p. 160. "Effects of Oil Additives For the Control of European Corn Borer in Peppers." p. 102. "Insecticide Evaluation for the Control of European Corn Borer in Field Corn." p. 152. "Insecticide Evaluation for the Control of European Corn in Seed Corn." p. 153. "Interaction Between Granular Insecticides and Incidence of Root Rot Diseases." p. 114. "Screening Foliar Insecticides in Sweet Corn." p. 93. "Screening Insecticides for the Control of Colorado Potato Beetles on Potatoes." p. 102. "The Efficacy of Herbicide-Fungicide Tank Mixes in Tomatoes." p. 284. "Tomato Fungicide Screening." p. 285. "Timing of Granular Insecticides for Insect Control in Potatoes." p. 113. "Weather-Timed Fungicide Spraying for Disease Control in Tomatoes I." p. 286. "Weather-Timed Fungicide Spraying for Disease Control in Tomatoes II." p. 287. "Weather-Timed Fungicide Spraying for Disease Control in Tomatoes III." p. 288. "Weather-Timed Fungicide Spraying for Disease Control in Tomatoes IV." p. 289. "Weather-Timed Fungicide Spraying for Disease Control in Tomatoes V." p. 290.

Pitblado, R.E., 1986. "Weather-Sensitive Spraying for Potatoes." *Potatoes in Canada, Agribook Magazine* 12(5), pp. 22-24.

Pitblado, R.E., 1986. "Computerized Weather Station and Pest Control Programs." *Agricultural Computer Extension Newsletter.* 5(2):3-4.

Ross, R.W., 1985. "Looking Forward." *Agricultural Computer Extension Newsletter.* 4(2):1.

Ross, R.W., 1985. "Sources of Information." *Agricultural Computer Extension Newsletter.* 4(2):4-5.

Ross, R.W., 1985. "Microcomputer Show Update." *Agricultural Computer Extension Newsletter.* 4(2):6.

Ross, R.W., 1985. "Where We're Going." *Agricultural Computer Extension Newsletter.* 4(2):8.

Ross, R.W., 1985. "Criteria for Evaluation of On-Farm Accounting Software." *Agricultural Computer Extension Newsletter.* 4(3):3-5.

Ross, R.W., 1985. "Where We're Going." *Agricultural Computer Extension Newsletter.* 4(3):5.

Ross, R.W., 1985. "Sources of Information." *Agricultural Computer Extension Newsletter.* 4(3):6-7.

Ross, R.W., 1985. "Predictions." *Agricultural Computer Extension Newsletter.* 4(3):8.

Ross, R.W., 1985. "Innovations in Spreadsheet Analysis and Farm Management." *Agricultural Computer Extension Newsletter.* 4(4):1-3.

Ross, R.W., 1985. "Sources of Information." *Agricultural Computer Extension Newsletter.* 4(4):7.

Ross, R.W., 1985. "Where We're Going." *Agricultural Computer Extension Newsletter.* 4(4):8.

Ross, R.W., 1985. "Testing the Tandy 1200 HD." *Agricultural Computer Extension Newsletter.* 4(5):5.

Ross, R.W., 1985. "Where We're Going." *Agricultural Computer Extension Newsletter.* 4(5):5.

Ross, R.W., 1985. "Sources of Information." *Agricultural Computer Extension Newsletter.* 4(5):6.

Ross, R.W., 1985. "Calendar." *Agricultural Computer Extension Newsletter.* 4(5):7.

Ross, R.W., 1986. "Database Management." *Agricultural Computer Extension Newsletter.* 5(1):1-3.

Ross, R.W., 1986. "Agricultural Computer Extension in Canada." *Agricultural Computer Extension Newsletter.* 5(1):6-7.

Ross, R.W., 1986. "Sixth Annual Agricultural Microcomputer Seminar and Show." *Agricultural Computer Extension Newsletter.* 5(1):7.

Ross, R.W., 1986. "Where We're Going." *Agricultural Computer Extension Newsletter.* 5(1):8.

Ross, R.W., 1986. "Where We're Going." *Agricultural Computer Extension Newsletter.* 5(2):6.

Ross, R.W., 1986. "What Is a User's Group?" *Agricultural Computer Extension Newsletter.* 5(2):6.

Ross, R.W., 1986. "Sources of Information." *Agricultural Computer Extension Newsletter.* 5(2):6.

Smid, A.E., 1985. "Corn-Soy Ration Faces Rival." *Farm and Country.* Oct. 22, p. 17.

Smid, A.E., 1985. "Higher Grain Yields Here." *Farm and Country.* Sept. 17, p. 34.

Smid, A.E., 1985. "Researchers Look at Sorghums." *The Furrow.* 90(3):26.

Smid, A.E. and Morris, J.R., 1986. "Naked or Hull-less Oats for Pigs." *Highlights agri. res. Ont.* 9(1):22-24.

Stevenson, C.K., 1985. "Maximum Yield Research With Corn and Soybeans." *Highlights agric. res. Ont.* 8(2):6-10.

Stevenson, C.K., 1986. "Maximum Yield Update." *Corn in Canada.* 12(3):23.

Stevenson, C.K., 1986. "Ontario Corn Research Achieves 293 bu/acre Yield." *Better Crops With Plant Food.* 70 (Spring):9.

Stevenson, C.K., 1985. "Special Considerations in Nitrogen Application." *Ontario Corn Producer.* 1(2):9.

Proceedings

Baldwin, C.S., 1985. "Windbreaks and Crop Production." *Proc. — 40th Soil Conservation Society of America Mtg.* St. Louis, Missouri, July-Aug.

Baldwin, C.S., 1985. "Highlights in Ontario Research Concerns." *Proc. Exp. Conservation on Soil and Water.* Fredericton, N.B. Oct. 23-25.

Baldwin, C.S., 1985. "The Effect of Interseeded Grass or a Legume on the Growth and Yield of Corn." *Proc. IV International Conference on Soil Conservation.* Maracay, Venezuela. Nov. 3-9th.

Baldwin, C.S., 1986. "Windbreaks and Crop Production in Ontario." *Proc. Southwestern Ont. Farmers' Week.* RCAT, Jan. 6, pp. E1-E4.

Baldwin, C.S., 1986. "Windbreaks in Agriculture." *Proc. Ohio Federation of Soil and Water Conservation Districts.* Columbus, Ohio, Jan. 15.

Baldwin, C.S., 1986. "Care and Maintenance of Farm Windbreaks." *Proc. Ohio Federation of Soil and Water Conservation Districts.* Columbus, Ohio, Jan. 15.

Beattie, D., 1986. "Keeping Control of Your Business." *Proc. Southwestern Ont. Farmers' Week.* RCAT, Jan. 7, pp. B1-B3.

Beattie, D., 1986. "The Economics of Weed Control in Soybeans." *Proc. Southwestern Ont. Farmers' Week.* RCAT, Jan. 8, pp. B1-B4.

Beattie, D., 1986. "Comparison of Profitability Between Hog Farms and Others." *Proc. Southwestern Ont. Pork Producers Conf.* RCAT, Feb., pp. 11-13.

Brown, R.H., 1986. "Cost Effective Weed Control in Corn." *Southwestern Ont. Farmers' Week.* RCAT, Jan. 8, pp. F1-F5.

Conway, D.M., 1986. "Nutrition of the Weaned Pig." *Proc. 1986 Swine Production Update for Women.* RCAT, Feb.

Doidge, B.R., 1985. "Basis, Pricing, and Outlook — Corn and Hogs." *Proc. Advance Commodity Marketing Course.* Wingham, Nov.

Doidge, B.R., 1986. "Commodity Options — How to Use Them." *Proc. Southwestern Ont. Farmers' Week.* RCAT, Jan. 7, pp. B1-B5.

Doidge, B.R., 1986. "Marketing Ontario Grain Corn in 1986." *Proc. Southwestern Ont. Farmers' Week.* RCAT, Jan. 7, pp. H1-H4.

Johnston, R.W., 1986. "On Farm Trials." *Proc. Southwestern Ont. Farmers' Week.* RCAT, Jan. 6, pp. A1-A2.

Morris, J.R., 1985. "Records — a Balanced Perspective." *Proc. 1985 Ontario Pork Congress.* Stratford, pp. 31-45.

Morris, J.R., 1986. "Roasted Soybeans for Growing-Finishing Pigs." *Proc. 1986 Southwestern Ont. Pork Producers Conf.* RCAT, Feb., pp. B1-B6.

Morton, J.G., 1986. "Chemical Control of Cereal Diseases." *Proc. Southwestern Ont. Farmers' Week.* RCAT, Jan. 10, p. B1.

Muehmer, J.K., 1985. "The Effects of Nutrient Root Dips on Tomato Transplants in Ontario." *Proc. of Seminar of the Timing of Field Production of Vegetables, American Soc. of Hort. Sci.* Oct./Nov., Tampa, Fla.

Muehmer, J.K., 1985. "The Effects of Cover Crops on Tomato Production." *Proc. of Seminar on the Timing of Field Production of Vegetables, American Soc. of Hort. Sci.* Oct./Nov., Tampa, Fla.

Nanni, C.J., 1986. "Interseeding in Corn (Research Update)." *Proc. Sothwestern Ont. Farmers' Week.* RCAT, Jan. 6, pp. C1-2.

Pitblado, R.E., 1986. "Disease/Insect Update — 1986." *Proc. Southwestern Ont. Farmers' Week.* RCAT, Jan. 10, pp. H20-22.

Pitblado, R.E., 1986. "Computerized Weather Station and Pest Control Programs." *O.A.C. Agric. Conf. Microcomputing for Agriculture.* Guelph, Jan.

Pitblado, R.E., 1986. "Weather-timed Spraying of Field Tomatoes." *O.V.G.M.B. Ann. Rept.*, Toronto, Feb., pp. 175-176.

Ross, R.W., 1985. "Computers On The Farm." *Proc. First International Conf. on Computers and Human Development.* Toronto, May.

Ross, R.W., 1985. "Innovation in Spreadsheet Analysis and Farm Management." *Canadian Agricultural Economics and Farm Management Society Annual Meeting.* Charlottetown, Prince Edward Island, June.

Ross, R.W., 1985. "Computers On The Farm — Public Sector and Private." *Canadian Farm Writers Association Annual Meeting.* Toronto, Nov.

Ross, R.W., 1986. "Database Management Systems." *KCAT Computer Show.* Kemptville, Dec.

Ross, R.W., 1986. "How Much Should You Pay For Land?" *Proc. of Farm Management Day.* Southwestern Ont. Farmers' Week. RCAT, Jan. 7, pp. C1-C3.

Ross, R.W., 1986. "Basics of Microcomputers and Their Use." *Proc. of the Weymouth Computer Seminar & Display for Farmers.* Weymouth, Nova Scotia, Mar.

Ross, R.W., 1986. "Software For Agriculture: Update." *Proc. of the Weymouth Computer Seminar & Display for Farmers.* Weymouth, Nova Scotia, Mar.

Ross, R.W., 1986. "Accounting — Application and Utility for Farming Operations." *Proc. of the Weymouth Computer Seminar & Display for Farmers. Weymouth, Nova Scotia, Mar.*

Ross, R.W., 1986. "Spreadsheets — Application and Utility for Farming Operations." Proc. of the Weymouth Computer Seminar & Display for Farmers. Weymouth, Nova Scotia, Mar.

Ross, R.W., 1986. "Databases — Application and Utility for Farming Operations." *Proc. of the Weymouth Computer Seminar & Display for Farmers.* Weymouth, Nova Scotia, Mar.

Ross, R.W., 1986. "Information Systems — Application and Utility for Farming Operations." *Proc. of the Weymouth Computer Seminar & Display for Farmers.* Weymouth, Nova Scotia, Mar.

Ross, R.W., 1986. "Should I Buy a Computer? — Factors to Consider." *Proc. of the Weymouth Computer Seminar & Display for Farmers.* Weymouth, Nova Scotia, Mar.

Ross, R.W., 1986. "Basics of Microcomputers and Their Use." *Proc. of the Kentville Computer Seminar & Display for Farmers.* Kentville, Nova Scotia, Mar.

Ross, R.W., 1986. "Software For Agriculture: Update." *Proc. of the Kentville Computer Seminar & Display for Farmers.* Kentville, Nova Scotia, Mar.

Ross, R.W., 1986. "Accounting — Application and Utility for Farming Operations." *Proc. of the Kentville Computer Seminar & Display for Farmers.* Kentville, Nova Scotia, Mar.

Ross, R.W., 1986. "Spreadsheets — Application and Utility for Farming Operations." *Proc. of the Kentville Computer Seminar & Display for Farmers.* Kentville, Nova Scotia, Mar.

Ross, R.W., 1986. "Databases — Application and Utility for Farming Operations." *Proc. of the Kentville Computer Seminar & Display for Farmers.* Kentville, Nova Scotia, Mar.

Ross, R.W., 1986. "Information Systems — Application and Utility for Farming Operations." *Proc. of the Kentville Computer Seminar & Display for Farmers.* Kentville, Nova Scotia, Mar.

Ross, R.W., 1986. "Should I Buy a Computer? — Factors to Consider." *Proc. of the Kentville Computer Seminar & Display for Farmers.* Kentville, Nova Scotia, Mar.

Ross, R.W., 1986. "Basics of Microcomputers and Their Use." *Proc. of the Truro Computer Seminar & Display for Farmers.* Truro, Nova Scotia, Mar.

Ross, R.W., 1986. "Software for Agriculture: Update." *Proc. of the Truro Computer Seminar & Display for Farmers.* Truro, Nova Scotia, Mar.

Ross, R.W., 1986. "Accounting — Application and Utility for Farming Operations." *Proc. of the Truro Computer Seminar & Display for Farmers.* Truro, Nova Scotia, Mar.

Ross, R.W., 1986. "Spreadsheets — Application and Utility for Farming Operations." *Proc. of the Truro Computer Seminar & Display for Farmers.* Truro, Nova Scotia, Mar.

Ross, R.W., 1986. "Databases — Application and Utility for Farming Operations." *Proc. of the Truro Computer Seminar & Display for Farmers.* Truro, Nova Scotia, Mar.

Ross, R.W., 1986. "Information Systems — Application and Utility for Farming Operations." *Proc. of the Truro Computer Seminar & Display for Farmers.* Truro, Nova Scotia, Mar.

Ross, R.W., 1986. "Should I Buy a Computer? — Factors to Consider." *Proc. of the Truro Computer Seminar & Display for Farmers.* Truro, Nova Scotia, Mar.

Ross, R.W., 1986. "Basics of Microcomputers and Their Use." *Proc. of the Antigonish Computer Seminar & Display for Farmers.* Antigonish, Nova Scotia, Mar.

Ross, R.W., 1986. "Software for Agriculture: Update." *Proc. of the Antigonish Computer Seminar & Display for Farmers.* Antigonish, Nova Scotia, Mar.

Ross, R.W., 1986. "Accounting — Application and Utility for Farming Operations." *Proc. of the Antigonish Computer Seminar & Display for Farmers.* Antigonish, Nova Scotia, Mar.

Ross, R.W., 1986. "Spreadsheets — Application and Utility for Farming Operations." *Proc. of the Antigonish Computer Seminar & Display for Farmers.* Antigonish, Nova Scotia, Mar.

Ross, R.W., 1986. "Databases — Application and Utility for Farming Operations." *Proc. of the Antigonish Computer Seminar & Display for Farmers.* Antigonish, Nova Scotia, Mar.

Ross, R.W., 1986. "Information Systems — Application and Utility for Farming Operations." *Proc. of the Antigonish Computer Seminar & Display for Farmers.* Antigonish, Nova Scotia, Mar.

Ross, R.W., 1986. "Should I Buy a Computer? — Factors to Consider." *Proc. of the Antigonish Computer Seminar & Display for Farmers.* Antigonish, Nova Scotia, Mar.

Smid, A.E., 1985. "ICM Cultural Practices in Ontario." *Proc. Integrated Cereal Management Seminar.* Guelph (1)29-59

Smid, A.E., 1986. "Intensive Wheat Management." *Proc. Southwestern Ont. Farmers Week.* RCAT, Jan. 10, pp. D13-D17.

Stevenson, C.K., 1985. "Maximum Yield Corn Research." *Proc. of FAR/PPI Workshop on the Physiology, Biochemistry, and Chemistry Associated With Maximum Yield Corn.* St. Louis, Missouri, Nov.

Stevenson, C.K., 1985. "Maximum Yield Research." *Proc. International Minerals & Chemicals Corporation Maximum Economic Yield Forum.* Tampa, Florida, Sept.

Stevenson, C.K., 1985. "Maximum Yield Research With Corn and Soybeans." *North Central Extension-Industry Soil Fertility Workshop.* St. Louis, Missouri, Oct.

Stevenson, C.K., 1985. "The Economics of Fertilization." *Proc. Southwestern Ont. Farmers' Week.* RCAT, Jan. 8, pp. E1-E4.

Underwood, J.A., 1986. "Rodent Damage — A Case Study." *Proc. Southwestern Ont. Pork Producers Conference.* RCAT, Feb., pp. R1.

Underwood, J.A., 1986. "Barn Renovations — Mechanical to Natural Ventilation." *Proc. 1986 Southwestern Ont. Pork Producers Conference.* RCAT, Feb., pp. P1-P4.

Vander Wielen, A.L., 1985. "Beef Research — Protein Levels." *Proc. Bruce Cattlemen's Association.* Annual fall meeting, Brantford, Nov.

Vander Wielen, A.L., 1986. "Protein Levels in the Feedlot." *Proc. Beef Days Grey-Bruce Farmers' Week.* Chesley, Jan.

BOOKS, THESES, REPORTS

Morris, J.R., 1985. *Swine Research.* RCAT Livestock Res. Rpt. 1984-85, pp. 1-24.

Morton, J.G., 1986. *Vegetable Fertilizer Trials — 1985.* RCAT, Tech. Rept. RCAT, Feb., 21 pp.

Pitblado, R.E. and Morton, J.G., 1985. *Fungicide and Insecticide Trials — 1985.* RCAT Tech. Rept. RCAT, Feb., 76 pp.

Ross, R.W., 1985. *Introduction to Computers.* Canadian Agri-Marketing Association Computer Clue-In Sourcebook. Guelph, June.

Ross, R.W., 1985. *Computer Novice Clue-In.* Canadian Agri-Marketing Association Computer Clue-In Sourcebook. Guelph, June.

Ross, R.W., 1985. *Use of the Computer for the Pork Producer.* RCAT Livestock Res. Rept. 1984-85. Sept.

Ross, R.W., 1985. *Introduction to Computers.* RCAT Livestock Res. Rept. 1984-85. Sept.

Ross, R.W., 1985. *Criteria for Evaluating On-Farm Accounting Software.* RCAT Livestock Res. Rept. 1984-85. Sept.

Ross, R.W., Fackelmann, H., Lindsay, R., and Billings, B., 1986. *Agricultural Software Catalog 1986.* O.M.A.F. Publication, Feb.

Smid, A.E., 1985. *Barley Winter Hardiness Nursery 1985.* USDA, Penn. State Univ., University Park, Pa., Aug.

Smid, A.E., 1985. *Progress Report on Barley, Oats and Wheat — Regional Tests in Ontario 1985.* Univ. of Guelph, Nov.

Smid, A.E., 1986. *Annual Report on Co-operative Winter Wheat Variety Tests in Ontario 1985.* Univ. of Guelph, Jan.

Smid, A.E., 1986. *Progress Reports on Regional Production, Eastern, Screening and Co-operative barley and Oat Tests 1985.* Agric. Can. Ottawa Res. Stn. Reports 163, 164, 165, 166, 167, 168, 173, 174.

Smid, A.E., 1986. *Uniform Winter Barley Nursery — Hardy Varieties 1985.* USDA, Agric. Res. Cntr., W. Beltsville, Md., Jan.

Sojak, M. and Morris, J.R., *The Effect of Various Cooling Methods and the Performance of Growing Finishing Pigs.* Ontario Swine Research Review 1985. University of Guelph, pp. 74-75.

Sojak, M. *Spray Cooling Versus Evaporative Cooling of Pigs.* RCAT Livestock Res. Report 1984-85, pp. 25-30.

Vander Wielen, A.L., 1985. *Beef Cattle Research and Dairy Cattle Research.* RCAT Livestock Res. Report 1984-85, pp. 48-71.

KEMPTVILLE COLLEGE OF AGRICULTURAL TECHNOLOGY

PERIODICALS

Curnoe, W.E., 1985. "A Winning Combination — Corn and Alfalfa." *Ont. Corn Producer.* May: 6-7.

Dreyjany, L.A., 1986. "Bypass protein and iso-acids — Challenge of the 1990's." *Highlights agric. res. Ont.* 9(1):16-21.

Dreyjany, L.A., Chandler, W.V. and Hooper, G.S., 1985. "Proposed poplar wood pellets as a source of energy for Holstein bull calves." *Can. J. Anim. Sci.* 64:1035-44.

Hoekstra, G.J., 1986. "Learning from '85 for '86. *Agribook* magazine (*Corn in Canada*) 12(3):30.

Hoekstra, G.J., 1985. "Exciting new trends in cereal production." *Contact* 11(1):2.

Hoekstra, G.J., 1985. "Illicit crops are hurting Peru's dairy industry." *Contact.* 11(2)6.

Hoekstra, G.J., Kannenberg, L.W. and Christie, B.R., 1985. "Grain yield comparison of pure stands and equal proportion mixtures for seven hybrids of maize." *Can. J. Plant Sci.* 65:471-479.

Hoekstra, G.J., Kannenberg, L.W. and Christie, B.R., 1985. "Grain yield comparison of pure stands and mixtures of different proportions for two hybrids of maize." *Can. J. Plant Sci.* 65:481-485.

Hoekstra, G.J., 1985. "Grain yield comparison of pure stands and equal proportion mixtures for seven hybrids of maize." *Agrologist* 14(3)29.

Ingratta, W.J. and McLaughlin, I.E., 1985. "Effect of cultural systems on the Veestar strawberry." *Rpt. of Comm. on Hort. Res.* Can. Hort. Council, p. 154.

Langenberg, W.J. and Hossie, W.R., 1985. "Regional potato cultivar trials." *Ont. Reg. Potato Comm. Rpt.* pp. 21-24.

Langenberg, W.J. and Hossie, W.R., 1985. "Regional tomato cultivar trials." *Ont. Reg. Tomato Comm. Rpt.* pp. 16-18.

Langenberg, W.J. and Hossie, W.R., 1985. "Asparagus cultivar trials." *Ont. Reg. Asparagus Comm. Rpt.* pp. 6-9.

Langenberg, W.J. and Hossie, W.R., 1985. "Broccoli and cauliflower cultivar trials." *Ont. Reg. Crucifer Comm. Rpt.* pp. 13-14.

Langenberg, W.J. and Hossie, W.R., 1985. "Evaluating an economizer in reducing maple syrup production costs." *Rpt. of Comm. on Hort. Res.* Can. Hort. Council, p. 154.

Langenberg, W.D. and Hossie, W.R., 1985. "Eastern Ontario early potato cultivar trial." *Rpt. of Comm. on Hort.* Res. Can. Hort. Council, p. 154.

MacDonald, D.W. and Rowan, M.L., 1984. Abstrs. in *Exp. Comm. on Weeds, Res. Rpt.*, East Sect. "Annual weed control in alfalfa." pp. 15-16. "Quackgrass control in red clover." p. 17. "Annual weed control in barley." p. 54. "Herbicides for annual weed control in Cereals." p. 55. "Herbicide evaluation in corn." pp. 129-131. "Herbicide evaluation in soybeans." pp. 245-248. "Nutsedge control in soybeans." p. 547.

McKwen, P.L., 1986. "Longevity in dairy cows." *Winchester Press.* Apr. 21, p. 10.

Sheard, R.W., Curnoe, W.E. and Ferguson, J.A., 1985. "Potassium recommendations for alfalfa: A Computer based system." *Highlights agric. res. Ont.* 8(2):14-16.

Wheeler, E.E., 1985. "Feed supplement claims tested by KCAT research." *Winchester Press.* Oct. 2, p. B-2.

Wheeler, E.E., 1985. "Kemptville College herd helps teach dairy management." *Dairy Farmer.* 2(1):26-27.

PROCEEDINGS

Curnoe, W.E., 1986. "Time and Timing." *Proc. Crops Day, Eastern Ontario Farmers' Week*, p. 5.

Curnoe, W.E., 1986. "Micronutrient needs in Lanark County." *Proc. Lanark Seed Fair*, pp. 1-2.

Dreyjany, L.A., 1986. "Importance of colostrum to the newborn calf." *Proc. Quinte Livestock Days*, Feb. pp. D1-D5.

Dreyjany, L.A., 1986. "Dairy calf management — birth to weaning." *Proc. East Central Farm Conference*, Jan. pp. D1-D4.

Dreyjany, L.A., 1986. "Calf nutrition and management." *Shur-Gain Annual Nutrition and Health Seminar*, J... pp. 1-4.

Ingratta, W.J. "Strawberry cultural practices." *Small Fruit Day, Ont. Hort. Conf.*, Toronto, Feb., 1986.

Ingratta, W.J. "Lowbush blueberry workshop." *Belleville*, Mar. 1986.

Langenberg, W.J., 1985. "Evaluating an economizer in reducing maple syrup production costs." *Ont. Maple Syrup Producers' Assoc. Conf.* Haliburton, pp. 1-2.

Langenberg, W.J., 1985. "Evaluating an economizer in reducing maple syrup production costs." *Ont. Maple Syrup Producers' Assoc. Information Days*, Renfrew, Lanark, Plum Hollow, Lancaster and Campbellford, pp. 1-2.

Langenberg, W.J., 1985. "Tubing vs. buckets, A cost comparison." *Proc. Farmers' Week Program.* Kemptville, Feb.

MacDonald, D.W., 1986. "Control of problem weeds." *Proc. Farmers' Week Program.* Kemptville, Feb.

Madill, J.E., 1985. Report on field trials of varieties and mixtures. *Ont. Forage Crop Investigation.* KCAT test results.

BOOKS, THESES, REPORTS

Curnoe, W.E., 1985. *Report of O.S.M.R.C. to OSAWRC.* Toronto, Dec.

Curnoe, W.E., MacDonald, D.W., Madill, J.E. and Hoekstra, G.J. *Agronomy Annual Report*, KCAT, Feb. 103 pp.

Curnoe, W.E., Ingratta, W.J. and Langenberg, W.J. *Horticulture Annual Report*, KCAT, Feb. 123 pp.

Dreyjany, L.A., Barclay, J., Earl, G. and Vokey, S., 1986. "Assesment of manure availablity and its final partitioning as it relates to single cell protein production." *Final report.* 35 pp.

Dreyjany, L.A., 1986. "*Towards success in heavy calf production.*" Lincoln Graphics, St. Catharines, 52 pp.

Hoekstra, G.J., 1985. *1986 Report Ont. hybrid corn performance trials.* Ont. Corn Comm. RCAT, Dec.

Hoekstra, G.J., 1985. *Report on eastern cooperative barley, oats, and spring wheat tests.* Agric. Can. Ottawa Res. Sta. Rpts. 165, 166, 167, 171, Jan.

Hoekstra, G.J., 1985. *Progress report on barley, oats and wheat: Regional tests in Ont.* Univ. of Guelph, Nov.

Hoekstra, G.J., 1985. *Annual report on cooperative winter wheat variety tests in Ont.* Univ. of Guelph, Nov.

Johnson, P.L., 1986. *The effect of postmortem conditions on the tenderness of veal calf longissimus dorsi muscles.* M.Sc. Thesis, Macdonald College, McGill Univ., Mar.

Langenberg, W.J., 1985. *Maple research in Ontario.* First Inaugural Research Report of the newly formed Ont. Maple Syrup Res. Comm. to HRIO, Univ. of Guelph, Dec.

UNIVERSITY OF GUELPH

BEEF

PERIODICALS

Buchanan-Smith, J.G., 1985. "Corn from different varieties for silage." *Beef Ind. Res. Rpt.*, Univ. of Guelph. 85-01-08.

Ganesh, D. and Mowat, D.N., 1985. "Integrated systems of producing beef and ethanol from fractionated maize silage." *Biomass* 7: 13-26.

Jones, C.R., Mowat, D.N., Buchanan-Smith, J.G. and Macleod, G.K., 1985. "Methane fermentation residue from cattle wastes has little feed value." *Beef Ind. Res. Rpt.* Univ. of Guelph. May.

Kemp, R.A. and Mowat, D.N., 1985. "Systems of utilizing maize stover for feeding growing cattle." *Agric. Systems* 16: 55-65.

King, G.J., 1985. "Charting reproductive activity in recently calved dairy and beef cows." *Highlights agric. res. Ont.* 8: 9-13.

Kubow, S., Bray, T.M. and Janzen, E.G., 1985. "Spin trapping studies of the effects of vitamin E and glutathione on free radical production induced by 3-methylindole." *Biochem. Pharmacol.* 34: 1117-19.

Macauley, S. and Mowat, D.N., 1985. "48-hour cow-calf separation with cows in moderate body condition markedly improves fertility." *Beef. Ind. Res. Rpt.* Univ. of Guelph. June.

McMorris, M.R. and Wilton, J.W., 1985. "Biology of cow weight and milk yield." *Breeder and Feeder* 166: 18.

McMorris, M.R. and Wilton, J.W., 1985. "Economics of cow weight and milk yield." *Breeder and Feeder* 167: 10.

Mowat, D.N., 1985. "Integrated beef production systems." *Breeder and Feeder*, Ont. Cattlemen's Assn. March.

Mowat, D.N., 1985. "Rumensin has additional benefits." *Breeder and Feeder*, Ont. Cattlemen's Assn. Nov.

Mowat, D.N., Jones, D.K. and Bilanski, W.K., 1985. "Feeding value of corn silage following partial grain removal." *Beef Ind. Res. Rpt.* Univ. of Guelph.

Ndlovu, N.R., Buchanan-Smith, J.G. and Mowat, D.N., 1985. "Supplementation of poor quality roughages with alfalfa and its effect on digestion in sheep." *Can. J. Anim. Sci.* 65: 693-704.

Richards, J.E. and Mowat, D.N., 1985. "Implanted bull calves with Ralgro decreases stress." *Beef Ind. Res. Rpt.* Univ. of Guelph. May.

Richards, J.E. and Mowat, D.N., 1985. "New applications for growth promotants." *Proc. Univ. of Guelph Nutr. Conf.*, April. pp. 56-63.

Richards, J.E. and Mowat, D.N., 1985. "Response to Compudose with heifers only for 84 days." *Beef Ind. Res. Rpt.* Univ. of Guelph. May.

Yadav, M.C., Leslie, K.E. and Walton, J.S., 1985. "The onset and duration of ovulation in superovulated beef heifers." *Theriogenology* 23: 237.

PROCEEDINGS

Allen, O.B., 1985. "Marginal likelihood estimators for growth curve data." *Abstr. of the 1985 Statistical Soc. of Canada Mtgs.*

Bilanski, W.K., Mowat, D.N. and Menzies, D., 1985. "Physical properties of alfalfa stems and leaves affecting their aerodynamic separation." *Proc. 3rd Intl. Conf. on Phys. Prop. Agric. Materials*. Prague, Czechoslovakia. pp. 51-56.

Buchanan-Smith, J.G., 1985. "Nutritional management to alleviate stress in calves started on corn silage." *Proc. CFIA-Univ. of Guelph Nutr. Conf. for Feed Manufacturers*. pp. 105-12.

Buchanan-Smith, J.G., 1985. "Varieties of corn for silage and their influence on efficiency of beef production." *Proc. 35th Ann. Mtg. Can. Soc. Anim. Sci.* Univ. of P.E.I., Charlottetown, June. p. 16.

Jones, C.R., Mowat, D.N., Buchanan-Smith, J.G. and Macleod, G.K., 1985. "Nutritional value of methane fermentation residue produced from cattle and swine wastes." *Proc. Intl. Symp. on Microbial Biomass Proteins: Nutritional, Safety and Economic Aspects*. Univ. of Waterloo, June. p. 23.

Jones, D.K., Bilanski, W.K. and Mowat, D.N., 1985. "Fractionation of mature wholeplant corn silage for integrated farming." *Am. Forage and Grassland Council*. pp. 279-82.

Kirkland, J.B., Bettger, W. and Bray, T.M., 1985. "The effect of 3-methylindole on the synthesis of phospholipids in cultured fibroblast cells." *Fed. Proc.* 44: 938.

Kirkland, J.B. and Bray, T.M., 1985. "The ratio of phosphatidylchlorine and neutral lipid synthesis as a biochemical index of the pneumotoxicity of 3-methylindole." *Can. Fed. Biol. Soc.* 28: 95.

McBride, B.W., 1985. "Solid-state 13C (CP/MAS) NMR spectroscopy of forages." *Proc. 21st Nutri. Conf. for Feed Manufacturers*. pp. 45-55.

Ndlovu, L.R. and Buchanan-Smith, J.G., 1985. "Utilization of corncob diets by sheep: Effect of protein supplementation." *Proc. 35th Ann. Mtg. Can. Soc. Anim. Sci.* Univ. of P.E.I., Charlottetown, June. p. 23.

BOOKS, THESES, REPORTS

Buchanan-Smith, J.G., 1985. "Evaluation of corn silage varieties." *Ont. Beef Feedlot Sch.* sponsored by Ont. Cattlemen's Assn. Sept.

Buchanan-Smith, J.G., 1985. *How to get more out of a pile of silage - NPN additives*. Beef Feedlot Day sponsored by Centralia College of Agric. Technol. and OMAF, Centralia, Alliston, and Chesley. Feb.

Jansen, G.B., 1985. *Selection and mating strategies to improve quadratic merit*. Ph.D. Thesis. Univ. of Guelph.

Jones, C.R., 1985. *Nutritional value of methane fermentation residue produced from animal wastes*. M.Sc. Thesis. Univ. of Guelph.

Kemp, R.A., 1985. *The effects of positive assortative mating and preferential treatment of progeny on the estimation of breeding values*. Ph.D. Thesis. Univ. of Guelph.

Macleod, G.K., Buchanan-Smith, J.G. and Mowat, D.N., 1985. *Protein requirements of large framed feedlot cattle*. Beef Cattle Res. Rpt. to the Industry. Univ. of Guelph.

McMorris, M.R., 1985. *Breeding systems, cow weight and milk yield effects on various biological and economic parameters in beef production*. M.Sc. Thesis. Univ. of Guelph.

McMorris, M.R. and Wilton, J.W., 1985. *Influence of breeding system, milk yield and cow weight on output to weaning in beef cattle*. 35th Ann. Mtg. Can. Soc. Anim. Sci. Charlottetown, Prince Edward Island.

McWhir, J. and Wilton, J.W., 1985. *Prediction of market traits for performance tested beef cattle*. 77th Ann. Mtg. Am. Soc. Anim. Sci. Athens, Georgia.

Mowat, D.N. and Bilanski, W.K., 1985. *Feeding by-products of ethanol production from corn*. Final Rpt. D55 Contract No. 24ST-01916-3-EL24. Agric. Canada. pp. 1-48.

Mowat, D.N., Macleod, G.K. and Buchanan-Smith, J.G., 1985. *Nutritional evaluation of residue from a methane fermentation of animal wastes*. Final Rpt. NSERC Strategic Grant #G0978. May. pp. 1-11.

Ndlovu, L.R., 1985. *Alfalfa supplementation of poor quality roughages fed to sheep*. Ph.D. Thesis. Univ. of Guelph.

Richards, J.E., 1985. *New Applications for growth promotants in cattle*. M.Sc. Thesis. Univ. of Guelph.

Yadav, M.C., 1985. *Endocrine changes and the timing of ovulation in superovulated cows*. Ph.D. Thesis. Univ. of Guelph.

DAIRY

PERIODICALS

de Alba, J. and Kennedy, B.W., 1985. "Milk production in the Latin-American Milking Criollo and its crosses with the Jersey." *Anim. Prod.* 41: 143-50.

Bagg, J.G., Grieve, D.G., Burton, J.H. and Stone, J.B., 1985. "Effect of protein on growth of Holstein heifer calves from 2 to 10 months." *J. Dairy Sci.* 68: 2929-39.

Campbell, C. and Buchanan-Smith, J.G., 1985. "Ruminal degradation of alfalfa silage ensiled at different dry matter levels in lactating dairy cows." *Guelph Dairy Res. Rpt.* pp. 79-85.

Dadati, E., Kennedy, B.W. and Burnside, E.B., 1985. "Relationships between conformation and reproduction in Holstein cows: type and calving performance." *J. Dairy Sci.* 68: 2639-45.

Hurnik, J.F., Webster, A.B. and DeBoer, S., 1985. "Skin temperature differences in relation to estrus in dairy cattle." *J. Anim. Sci.* 61: 1095-1102.

Macleod, G.K., 1985. "Feeding soybeans to dairy cattle - Ask the Expert." *Ont. Milk Prod.* July. p. 36.

Mazengera, K.E., Kennedy, B.W., Burnside, E.B., Wilkie, B.N. and Burton, J.H., 1985. "Genetic parameters of bovine serum immunoglobulins." *J. Dairy Sci.* 68: 2309-14.

Schaeffer, L.R., 1985. "Model for international evaluation of dairy sires." *Livestock Production Sci.* 12: 105-15.

Sorensen, D.A. and Kennedy, B.W., 1985. "Relationships between herd type and genetic and environmental variances in Holsteins." *J. Dairy Sci.* 68: 1770-77.

Van Doormaal, B.J., Schaeffer, L.R. and Kennedy, B.W., 1985. "Estimation of genetic parameters for stayability in Canadian Holsteins." *J. Dairy Sci.* 68: 1763-69.

Vorstermans, J.P.M. and Walton,J.S., 1985. "Effect of intermittent injections of gonadotrophin-releasing hormone at various frequencies on the release of luteinizing hormone and ovulation in dairy cows." *Anim. Reproduction Sci.* 8: 335-47.

Walton, J.S., 1985. "Effect of active immunization against androstenedione on ovarian function in dairy cows and prepubertal gilts." *Anim. Reproduction Sci.* 8: 349-64.

PROCEEDINGS

Amyot, E. and Hurnik, J.F., 1985. "Manifestation of estrus in dairy cows." *Proc. Can. Soc. Anim. Sci. Mtg.* Charlottetown, P.E.I. (Abstr.) p. 51.

Burnside, E.B., 1985. "Potential for evaluation of sires and cows using a subjective scoring for milking speed." *Proc. Ont. Dairy Symposium for Large Herd Operators.* Toronto. p. 5.

Campbell, C. and Buchanan-Smith, J.G., 1985. "Ruminal degradation of alfalfa silage at three dry matter levels in dairy cows." *proc. 35th Ann. Mtg. Can. Soc. Anim. Sci.* Univ. of P.E.I., Charlottetown, P.E.I., June. p. 14.

Engelhardt, H. and Walton, J.S., 1985. "The effect of estradiol valerate on luteolysis, LH release and follicular status in dairy cows." *J. Bio. and Reproduction* 32 (Suppl. 1): 133. Abstr. 192.

Grieve, D.G. and Boisclair, Y., 1985. "Relationship of prepartum energy intake and body composition with postpartum health and performance of dairy cows." *21st Univ. of Guelph Nutr. Conf. for Feed Manufacturers.* Toronto, May. pp. 119-26.

Hickey, G.J., Walton, J.S., Harper, H. and Hansel, W., 1985. "Partial purification of a luteotropic substance from allantoic fluids of 28-37 day bovine conceptuses." *Bio. of Reprod.* 32 (Suppl. 1): 64. Abstr. 53.

Kennedy, B.W., 1985. "Genetic changes in Canadian Holsteins." *Proc. Cuba-Ontario Holstein Seminar.* pp. 1-3.

Martineau, N.A. and Walton, J.S., 1985. "Treatment with progesterone or prostaglandin F2a during early pregnancy in dairy cows." *J. Anim. Sci.* 61 (Suppl. 1): 388. Abstr. 439.

Sinnott, P.M., Stone, J.B., Grieve, D.G., and McMillan, I., 1985. Blended versus non-blended diets for dairy cattle in conventional housing. *Proc. 35th Ann. Can. Soc. Anim. Sci.* Charlottetown, P.E.I., June.

Sorensen, D. and Kennedy, B.W., 1985. "Estimation of selection response and its variance using mixed model methodology." *Proc. 36th Ann. Mtg. Eur. Assn. Anim. Prod.* 1: (page numbers not available).

Walton, J.S. and King, G.J., 1985. "Indicators of estrus in Holstein-Friesian cows housed in tie stalls." *Am. Dairy Sci. Assn. Ann. Mtgs.* Univ. of Illinois. Urbana, Ill., June. (Abstr. P189.) p. 187.

Walton, J.S., Veenhuizen, L.P. and King, G.J., 1985. "Relationships between time of day, estrous behaviour and the preovulatory LH surge in Holstein-Friesian cows after treatment with PGF2a." *Am. Dairy Sci. Assn.* 68 (Suppl. 1): 187. (Abstr. P188.) June.

BOOKS, THESES, REPORTS

Boisclair, Y., Grieve, D.G. and Stone, J.B., 1985. *Influence of prepartum feeding and body condition on feed intake, milk production and health in early lactation.* Univ. of Guelph Dairy Res. Rpt. pp. 68-72.

Bowman, J.M., Grieve, D.G., Buchanan-Smith, J.G. and Macleod, G.K., 1985. *Response of dairy cows in early lactation to sodium hydroxide treated soybean meal.* Univ. of Guelph Dairy Res. Rpt. pp. 68-72.

Burnside, E.B., 1985. *Genetic update.* Can. Sire Analysts Workshop. Regina, Saskatchewan.

Campbell, C., 1985. *Protein degradation of alfalfa silage in dairy cows.* M.Sc. Thesis. Univ. of Guelph.

Dadati, E., Kennedy, B.W. and Burnside, E.B., 1985. *Relationships between conformation and calving performance in Holstein cows.* Guelph Dairy Res. Rpt. pp. 17-24.

De Alba, J. and Kennedy, B.W., 1985. *Milk production in the Latin American milking Criollo and its crosses with the Jersey.* Guelph Dairy Res. Rpt. pp. 1-8.

De Jager, D. and Kennedy, B.W., 1985. *Genetic parameters of milk yield and composition and their relationships with breeding goals under alternative pricing systems.* Guelph Dairy Res. Rpt. pp. 25-31.

Schell, J.C., 1985. *Protein degradation of unheated and sodium hydroxide treated soybean meal in growing steers.* M.Sc. Thesis. Univ. of Guelph.

Schell, J.C., Macleod, G.K., Allen, O.B. and Buchanan-Smith, J.G., 1985. *Protein degradation of unheated and sodium hydroxide treated soybean meal in growing steers.* Guelph Dairy Res. Rpt. pp. 86-91.

Soresen, D.A. and Kennedy, B.W., 1985. *Relationships between herd level for type and genetic and environmental variances in Holsteins.* Guelph Dairy Res. Rpt. pp. 41-48.

Van Doormaal, B.J., Burnside, E.B. and Schaeffer, L.R., 1985. *Prediction of sire proofs for stayability in Canadian Holstein milk-recording programs.* Guelph Dairy Res. Rpt., june. p. 49.

Yadav, M.C., 1985. *Endocrine changes and the timing of ovulation in superovulated cows.* Ph.D. Thesis. Univ. of Guelph.

SWINE

PERIODICALS

Atteh, J.O. and Leeson, S., 1985. "Effect of dietary soapstock on performance, nutrient digestibility and bone mineralization in weaner pigs fed two levels of calcium." *Can. J. Anim. Sci.* 65: 945-52.

Hudson, G.F.S. and Kennedy, B.W., 1985. "Charting genetic progress." *Hog Market Place Qtly.* Winter Issue. p. 52.

Hudson, G.F.S. and Kennedy, B.W., 1985. "Genetic evaluation of swine for growth rate and backfat thickness." pp. 83-91. "Genetic trend of growth rate and backfat thickness in Ontario swine." pp. 92-97. *J. Anim. Sci.* 61:

Hurnik, J.F., 1985. "Periparturient behaviour in swine." *Can. J. Anim. Sci.* 65: 777-78.

Kennedy, B.W., 1985. "New genetic evaluation system." *Can. Swine.* p. 62.

Kennedy, B.W., Johansson, K. and Hudson, G.F.S., 1985. "Heritabilities and genetic correlations for backfat and growth rate in performance tested pigs." *J. Anim. Sci.* 61: 78-82.

King, G.J. and Ackerley, C.A., 1985. "Demonstration of oestrogens in developing pig trophectoderm and yolk sac endoderm between Days 10 and 16." *J. Reprod. Fert.* 73: 361-67.

King, G.J., Walton, J.S. and Bellissimo, D.J., 1985. "Anestrus in pigs: Confirmation by a solid-phase RIA for progesterone and subsequent response to treatment." *Can. Vet. J.* 26: 2-6.

Lewis, N.J. and Hurnik, J.F., 1985. "The development of nursing behaviour in the sow." *Appl. Anim. Behav. Sci.* 14: 225-32.

Lun, A.K., Young, L.G. and Lumsden, J.H., 1985. "The effects of vomitoxin and feed intake on the performance and blood characteristics of young pigs." *J. Anim. Sci.* 61: 1178-85.

Rae, W., Jones, S.D.M. and Kennedy, B.W., 1985. "Pork carcass grading: The magnitude of breed and sex biases in the prediction of meat yield from a single fat measurement." *Can. J. Anim. Sci.* 65: 619-25.

Robertson, H.A., Dwyer, R.J. and King, G.J., 1985. "Oestrogens in fetal and maternal fluids throughout pregnancy in the pig and comparisons with the ewe and cow." *J. Endocrinol.* 106: 355-60.

Spratt, R.S. and Leeson,S., 1985. "The effect of raw ground full-fat canola on sow milk composition and piglet growth." *Nutr. Rpt. Intl.* 31: 825-31.

Walton, J.S., 1985. "A note on the effect of exposing gilts to a mature boar at 140 days of age." *Anim. Prod.* 41: 123-26.

Walton, J.S., 1985. "A note on the effect of puberty in gilts of exposure to a boar between 140 and 160 days of age." *Anim. Prod.* 41: 127-29.

Walton, J.S., 1985. "Effect of active immunization against androstenedione on ovarian function in dairy cows and prepubertal gilts." *Anim. Reprod. Sci.* 8: 348-64.

Walton, J.S., 1985. "Get sows bred quickly." p. 54. "Boar triggers young gilt estrus." p. 56. "When gilts respond." p. 58. "The aims to speed heat." p. 59. *Hog Marketplace Qtly.* Winter Issue.

PROCEEDINGS

Adeola, O. and Young, L.G., 1985. "Triticale in diets of growing pigs." *J. Anim. Sci.* 61 (Suppl. 1): 309.

Hudson, G.F.S. and Kennedy, B.W., 1985. "Genetic trends in Ontario swine for backfat and growth rate." *J. Anim. Sci.* 61 (Suppl. 1): 222.

Joyal, S.M. and Kennedy, B.W., 1985. "The influence of pretest feeding level on genetic evaluation of swine." *Proc. 35th Ann. Mtg. Can. Soc. Anim. Sci.* Charlottetown, P.E.I., June. p. 40.

Kennedy, B.W. and Hudson, G.F.S., 1985. "Application of an animal model to best linear unbiased prediction of breeding values of pigs." *Proc. 36th Ann. Mtg. Eur. Assn. Anim. Prod.* 1: (page numbers not available).

Wilkins, J.N. and Kennedy, B.W., 1985. "Breed, boar and environmental effects on frozen-thawed semen." *Proc. 1st Intl. Conf. on Deep Freezing of Boar Semen.* Uppsala, Sweden.

BOOKS, THESES, REPORTS

Adeola, O. and Young, L.G., 1985. "Triticale in diets of growing pigs." *Swine Res. in Ont. 1984.* Ont. Pork Producers' Mktg. Board. pp. 3-7.

Hudson, G.F.S. and Kennedy, B.W., 1985. "Genetic evaluation of swine for growth rate and backfat thickness." *Swine Res. in Ont. 1984.* Ont. Pork Producers' Mktg. Board. pp. 45-46.

Hudson, G.F. and Kennedy, B.W., 1985. "Genetic trends of growth rate and backfat thickness in Ontario swine." *Swine Res. in Ont. 1984.* Ont. Pork Producers' Mktg. Board. pp. 47-4[illegible]

Joyal, S.M., Kennedy, B.W. and Jones, S.M., 1985. "Utility of the EMME and Ultrasound backfat in predicting carcass merit." *Swine Res. in Ont. 1984.* Ont. Pork Producers' Mktg. Board. pp. 54-56.

Kennedy, B.W., Johansson, K. and Hudson, G.F.S., 1985. "Heritabilities and genetic correlations for backfat and growth rate in performance tested pigs." *Swine Res. in Ont. 1984.* Ont. Pork Producers' Mktg. Board. pp. 59-60.

Kennedy, B.W., Jones, S.D.M. and Rae, W., 1985. "Analysis of swine performance testing research project data." *Swine Res. in Ont. 1984.* Ont. Pork Producers' Mktg. Board. pp. 61-63.

Leeson, S., 1985. *Feeding soybeans to pigs and poultry.* Ann. Mtg. Ont. Soybean Growers Mktg. Board. Chatham, Dec.

Rae, W., Jones, S.M. and Kennedy, B.W., 1985. "Pork carcass grading: The magnitude of breed and sex biases and the prediction of meat yield from a single fat measurement." *Swine Res. in Ont. 1984.* Ont. Pork Producers' Mktg. Board. pp. 92-95.

Smith, T.K., 1985. "Prevention and treatment of mycotoxicoses." *Mycotoxins: A Canadian Perspective.* Eds. P. M. Scott, H.L. Trenholm and M.D. Sutton. Ottawa: Ntl. Res. Council of Can. pp. 99-101.

Young, L.G., 1985. "Nutrition and management of pigs for reproduction." *Swine Res. in Ont. 1984.* Ont. Pork Producers' Mktg. Board. pp. 127-29.

POULTRY

PERIODICALS

Atteh, J.O. and Leeson, S., 1985. "Effects of fat level on laying hens fed various concentrations of calcium." *Poultry Sci.* 64: 2090-97.

Atteh, J.O. and Leeson, S., 1985. "Influence of age, dietary cholic acid and calcium levels on performance, utilization of free fatty acids and bone mineralization in broilers." *Poultry Sci.* 64: 1959-71.

Atteh, J.O. and Leeson, S., 1985. "Response of laying hens to dietary saturated and unsaturated fatty acids in the presence of varying dietary calcium levels." *Poultry Sci.* 64: 520-28.

Bedford, M.R. and Summers, J.D., 1985. "Influence of the ratio of essential to nonessential amino acids on performance and carcass composition of the broiler chick." *Br. Poult. Sci.* 26: 483-91.

Chah, C.C., 1985. "Egg characteristics of high performance hens at the end of lay when given cafeteria access to energy, protein, and calcium." *Poultry Sci.* 64: 1696-1712.

Ferket, P.R. and Moran, E.T., 1985. "Effect of plane of nutrition from starting to and through the breeder period on reproductive performance of breeder tom turkeys." *Poultry Sci.* 64: 2110-18.

Leeson, S. and Summers, J.D., 1985. "Effect of cage versus floor rearing and skip-a-day versus every-day feed restriction on performance of dwarf broiler breeders and their offspring." *Poultry Sci.* 64: 1742-49.

Leeson, S. and Summers, J.D., 1985. "Early application at conventional or ahemeral photoperiods in an attempt to improve egg size." *Poultry Sci.* 64: 2020-26.

Leeson, S. and Summers, J.D., 1985. "Early reproductive characteristics of leghorn pullets reared on least cost formulated to protein and/or amino acid specifications." *Can. J. Anim. Sci.* 65: 205-10.

Leeson, S. and Summers, J.D., 1985. "Response of growing leghorn pullets to long or increasing photoperiods." *Poultry Sci.* 64: 1617-22.

Moran, E.T., 1985. "Digestion and absorption of carbohydrates in fowl and events through perinatal development." *J. Nutr.* 115: 665-74.

Moran, E.T., 1985. "Effect of toeclipping and pen population density on performance and carcass quality of large turkeys reared sexes separate." *Poultry Sci.* 64: 226-31.

Moran, E.T., 1985. "Variations in body composition of poultry." *Proc. Nutr. Soc.* 45: 57-65.

Morrison, W.D. and McMillan, I., 1985. "Operant control of the thermal environment by chicks." *Poultry Sci.* 64: 1656-60.

Newcombe, M. and Summers, J.D., 1985. "Effect of increasing cellulose in diets fed as crumbles or mash on the food intake and weight gains of broiler and leghorn chicks." *Br. Poultry. Sci.* 26: 35-42.

Shen, H., Summers, J.D. and Leeson, S., 1985. "Influence of supplemental fat and steam pelleting on the response of broilers to diets varying in energy density." *Anim. Feed Sci. and Technol.* 13: 57-67.

Summers, J.D., Hunt, E.C. and Leeson, S., 1985. "Canola meal for laying hens." *Can. J. Anim. Sci.* 65: 905-11.

Summers, J.D. and Leeson, S., 1985. "Available sodium and potassium in canola and soybean meal." *Can. J. Anim. Sci.* 65: 211-16.

Summers, J.D. and Leeson, S., 1985. "Broiler carcass composition as affected by amino acid supplementation." *Can. J. Anim. Sci.* 65: 717-23.

Summers, J.D. and Leeson, S., 1985. "Chlorine, niacin and thiamine supplementation of canola and soybean protein diets fed to broilers to 6 wk of age." *Can. J. Anim. Sci.* 65: 217-20.

Summers, J.D. and Leeson, S., 1985. "Effect of nutrient intake on performance of dwarf broiler breeders." *Poultry Sci.* 64: 1599-1601.

Summers, J.D. and Leeson, S., 1985. "Mineral profile of canola and soybean meal." *Can. J. Anim. Sci.* 65: 913-19.

Summers, J.D. and Leeson, S., 1985. "Self-selection by laying hens of diets differentiated by texture and colour." *Poultry Sci.* 64: 411-13.

Summers, J.D., Leeson, S., Bedford, M. and Spratt, D., 1985. "Influence of dietary protein and energy on performance and carcass composition of heavy turkeys." *Poultry Sci.* 64: 1921-33.

Summers, J.D., Leeson, S. and Shen, H., 1985. "Efficiency of turkeys versus broilers in the utilization of dietary protein." *Nutr. Rpt. Intl.* 31: 1219-30.

Williams, J.B., Etches, R.J. and Rzasa, J., 1985. "Induction of a pause in laying by corticosterone infusion or dietary alterations: the effects on the reproductive system, feed consumptions and body weight." *Br. Poult. Sci.* 26: 25-34.

PROCEEDINGS

Hurnik, J.F. and Lehman, H., 1985. "The philosophy of farm animal welfare: A contribution to the assessment of animal well being." *Proc. 2nd Eur. Symposium on Poultry Welfare.* Celle, Germany. pp. 255-66.

Luescher, U.A. and Hurnik, J.F., 1985. "Attempt to control oviposition in hen by operant conditioning." *Proc. Can. Soc. Anim. Sci. Mtg.* Charlottetown, P.E.I. p. 52 (Abstr.)

McMillan, E. and Moran, E.T., 1985. "Effect of feeding deoxynivalenol (DON) and zearalenone (F-2) to turkey poults." *Poultry Sci.* 64: 226-31.

Moran, E.T., 1985. "Egg quality with protein-calcium deficiency, cafeteria feeding, and cage density." *Poultry Sci.* 64 (Suppl. 1): 147.

Revington, W.H. and Moran, E.T., 1985. "Effect of plane of nutrition and feed form on the performance and carcass characteristics of heavy breeder tom turkeys." *Poultry Sci.* 64 (Suppl. 1): 168.

BOOKS, THESES, REPORTS

Etches, R.J. and Leeson, S., 1985. *Lighting and pullet maturity.* Poultry Ind. Sch. Guelph, Jan.

Leeson, S., 1985. *Calcium metabolism of layers.* E.C.A.N. Charlottetown, P.E.I., June.

Leeson, S., 1985. *Efficacy of virginiamycin for poultry.* Salsbury Lab. Mtg. Cambridge, Dec.

Leeson, S., b1985. *Feeding programs for leghorns.* Shaver Intl. Conf. Toronto, Sept.

Leeson, S., 1985. *Feeding the pullet right.* DEPMB Mtg. Cambridge and Ridgetown, Jan.

Leeson, S., 1985. *Leg problems in broilers.* AgriDays '85. Abbotsford, B.C., Oct.

Leeson, S., 1985. *Morphology and chemical characteristics of Canola as they influence nutritive value.* Am. Assn. Feed Microscopists. Ottawa, June.

Leeson, S., 1985. *Nutrient requirements of broiler breeders.* Proc. Maryland Nutr. Conf. Baltimore, Md., Mar.

Leeson, S., 1985. *Nutrition and health.* Ann. Mtg. Plant Products. Agric. Can. Toronto, Nov.

Leeson, S., 1985. *Nurition research in Ontario.* E.C.A.N. Charlottetown, P.E.I., June.

Leeson, S., 1985. *Nutritional considerations for poultry under heat stress.* Roche Nutr. Symposium. Toronto, April.

Leeson, S., 1985. *Nutritional programs for broiler breeders.* Agri-Days '85. Abbotsford, B.C., Oct.

Leeson, S., 1985. *Particle size preference by monogastrics.* Guelph Nutr. Conf. Toronto, April.

Leeson, S., 1985. *Poultry production.* Novice Farmers' Program, Continuing Education. Guelph, Nov.

Summers, J.D., 1985. *Amino acids - what they are and their place in poultry nutrition.* Alberta Poultry Ind. Conf.

Summers, J.D., 1985. *Energy requirements of breeders and turkeys.* Natl. Feed Ingredients Assn. Seminar. Chicago, Illinois, U.S.A.

Summers, J.D., 1985. *Feeding breeders.* Ont. Hatchery Workshop. Centralia College of Agric. Technol. Huron Park.

Summers, J.D., 1985. *Feeding our modern layer and broilers and broiler breeders.* Poultry Conf. Massey Univ., Palmerston North, New Zealand.

Summers, J.D., 1985. *Feeding the egg production type pullet.* Poultry Feeding and Nutr. Conf. Ohio State Univ., Indianapolis, Ohio, U.S.A.

Summers, J.D., 1985. *Feeding the modern layer.* Poultry Ind. Sch. Univ. of Guelph, Jan.

Summers, J.D., 1985. *High moisture corn for layers.* Ont. Egg Producers' Mktg. Board Seminar. Cambridge and Ridgetown.

Summers, J.D., 1985. *Poultry Nutritional Handbook.*

Summers, J.D., 1985. *What the future holds for poultry nutrition* Alberta Poultry Ind. Conf.

Summers, J.D., 1985. *Energy systems for poultry.* Natl. Feed Ingredients Assn. Seminar. Chicago, Illinois, U.S.A.

Zadworny, D., 1985. *Relationships between prolactin and reproductive function in female turkeys.* Ph.D. Thesis. Univ. Guelph.

CORN

PERIODICALS

Hoekstra, G.J., Kannenberg, L.W. and Christie, B.R., 1985. "Grain yield comparison of pure stands and equal proportion mixtures for seven hybrids of maize." *Can. J. Plant. Sci.* 65: 471-79.

Hoekstra, G.J., Kannenberg, L.W. and Christie, B.R., 1985. "Grain yield comparison of pure stands and mixtures of different proportions for two hybrids of maize."

Vyn, T.J., 1985. "Chisel plowing for corn production." *Ontario Corn Producer* 1(6): 3-5.

Vyn, T.J., 1985. "Conservation tillage for corn production." *Ontario Corn Producer.* 1(1): 6-7.

Vyn, T.J., 1985. "Zero tillage for corn production." *Ontario Corn Producer* 1(2): 4,5 and 34.

PROCEEDINGS

Cramer, M.M. and Kannenberg, L.W., 1985. "An evaluation of the HOPE corn breeding system." *77th Ann. Mtg. Am. Soc. Agron.* Chicago, Ill., U.S.A., Dec. Agron. Abstr. p. 51.

Kannenberg, L.W. and Cramer, M.M., 1985. "HOPE, a hierarchical, open-ended breeding system for corn." *77th Ann. Mtg. Am. Soc. Agron.* Chicago, Ill., U.S.A., Dec. Agron. Abstr. p. 59.

Valdes, E.V. and Hunter, R.B., 1985. Near infrared reflectance analysis (NIRA) of corn quality for silage production. *Can. Soc. Anim. Sci.* Charlottetown, P.E.I. (Abstr. No. 8518) p. 29.

BOOKS, THESES, REPORTS

Hunter, R.B., 1985. *Information for Industrial personnel.* OMAF and University of Guelph. Agdex No. 111/81. Nov.

Kannenberg, L.W., 1985. *Rpt. of the North Central Corn Breeding Res. Comm. (NCR-2) Mtg.* Reported by A.R. Hallauer. Report of the Sub-Committee on Uniform Tests in the 10-300 Maturity Series. Des. Plaines, Ill., Feb. pp. 38-42.

Sullivan, J.A., 1985. *Comparison of S1 per se and half-sib recurrent selection for PI (performance index) and associated changes in four maize populations.* Ph.D. Thesis. Univ. of Guelph, March.

CEREALS

PERIODICALS

Hunt, L.A. and van der Poorten, G., 1985. "Carbon dioxide exchange rates and leaf nitrogen contents during ageing of the flag and penultimate leaves of five spring-wheat cultivars." *Can. J. Bot.* 63: 1605-9.

Hunt, L.A., Kasha, K.J. and Reinbergs, E., 1985. "Winter wheat and triticale research." *Ann. Wheat Newsletter* 31: 52.

Kott, L.S., Howarth, M.J., Peterson, R.L. and Kasha, K.J., 1985. "Light and electron microscopy of callus initiation from haploid barley embryos." *Can. J. Bot.* 63: 1801-5.

Patel, J.D., Reinbergs, E. and Fejer, S.O., 1985. "Recurrent selection in doubled-haploid populations of barley (H. vulgare)." *Can. J. Genet. Cytol.* 27: 172-77.

Poysa, V.W. and Reinbergs, E., 1985. "OAC Decade winter triticale." *Can. J. Plant Sci.* 65: 451-52.

Reinbergs, E., 1985. "Barley in Ontario." *Barley Newsletter* 28.

Reinbergs, E., 1985. "OAC Acton Winter barley 1985." *Can. J. Plant Sci.* 65: 449-50.

Tanino, K.K. and McKersie, B.D., 1985. "Injury within the crown of winter wheat seedlings after freezing and icing stress." *Can. J. Bot.* 63: 432-36.

PROCEEDINGS

Keeler, L.C. and McKersie, B.D., 1985. "Effect of environmental factors on the hardiness of two cultivars of winter wheat." *Plant Physiol.* 77 (Suppl. 1): 135. (Abstr.)

Kendall, E.J., Katsaras, J., Stinson, R.H. and McKersie, B.D., 1985. "Phase transitions in freeze damaged membranes." *Plant Physiol.* 77 (Suppl. 1): 135. (Abstr.)

BOOKS, THESES, REPORTS

Anderson, M. and Reinbergs, E., 1985. "Barley breeding." Chapter 9. *ASA Barley Monograph.* pp. 231-68.

Borochov, A., Walker, M.A., McKersie, B.D. and Pauls, K.P., 1985. *Qualitative and quantitative effects of freezing on lipids and proteins of wheat membranes.* Can. Soc. Plant Physiol. Ottawa.

Bulman, P.G.M., 1985. *Relationships among tillering, spike number and grain yield in winter wheat (Triticum aestivum L.) in Ontario.* M.Sc. Thesis. Univ. of Guelph.

Choo, T.M. and Reinbergs, E., 1985. *Haploids for studying quantitative inheritance.* Can. Soc. Agron. Ann. Mtg. Charlottetown, P.E.I., June.

Choo, T.M., Reinbergs, E. and Kasha, K.J., 1985. "Use of haploids in breeding barley." *Plant Breeding Reviews*, Vol.3, Chapter 5. Ed. Jules Janick. PP. 219-52.

Fejer, S.O., Reinbergs, E. and Kasha, K.J., 1985. "Doubled haploid barley diallel and selection experiments." *Proc. 15th Int. Congr. of Genetics.* New Delhi, India.

Hunt, L.A., 1985. "Relationships between photosynthesis transpiration and nitrogen content in the flag and penultimate leaves of wheat." *Wheat Growth and Modelling.* Eds. W. Day and R.K. Atkin. Plenum. pp. 149-56.

Hunt, L.A., 1985. "Seeding rates in cereal tests." Section for Ont. Cereal Crops Comm. *Handbook on Cereal Test Procedures.*

Hunt, L.A., 1985. "Wheat breeding." *Crop Sci. Ann. Rpt.*

Hunt, L.A., 1985. *Breeding for bread quality in winter wheat.* Cereal Quality Group. Toronto.

Hunt, L.A., 1985. *Genetic coefficients and crop modelling.* IBSNAT Workshop. Lahaiina, Hawaii.

Hunt, L.A., 1985. *Hard Red Wheat research.* Ann. Mtg. Ont. Red Wheat Assn.

Hunt, L.A., 1985. *Hard Red Wheat varieties and production technologies.* OAC Agric. Guelph.

Hunt, L.A., 1985. *Progress Report, Barley, Oats, Wheat, Regional Tests in Ontario.* Dept. of Crop Sci., Univ. of Guelph. 70 pp.

Hunt, L.A., 1985. *Wheat and triticale tests in Ontario.* Rpt. to the Wheat and Triticale Subcomm. of the Exp. Comm. on Grain Breeding. Saskatoon, Sask.

Hunt, L.A., 1985. *Wheat production in Eastern Canada.* Can. Wheat. Production Symposium. Saskatoon, Sask., March.

Hunt, L.A., 1985. *Winter wheat cooperative tests. Seeding rate for cereal tests.* Rpts. to the Ont. Cereal Crops Comm. Toronto.

Hunt, L.A. and Mehta, P.N., 1985. *Ann. Rpt. on Cooperative Winter Wheat Tests in Ontario.* Crop Sci. Dept., Univ. of Guelph. (with Agric. Can and RCAT).

Keeler, L.C., 1985. *Genotypic and environmental effects on the cold, icing and flooding tolerances of winter wheat.* M.Sc. Thesis. Univ. of Guelph.

Kuruvinashetti, M.S., 1985. *In vitro selection for lysine and threonine mutants in barley (Hordeum vulgare L.).* Ph.D. Thesis. Univ. of Guelph.

Marsolais, A.A., 1985. *Callus induction from barley microspores.* Ph.D. Thesis. Univ. of Guelph.

Patel, J.D., Choo, T.M. and Reinbergs, E., 1985. *Selection of potentially good crosses of barley using the doubled haploid technique.* Can. Soc. Agron. Ann. Mtg. Charlottetown, P.E.I., June.

Reinbergs, E., 1985. *Barley breeding and research at Guelph.* Progress Rpt. for Brewing and Malting Barley Res. Inst.

Reinbergs, E., 1985. *Contributions of plant breeding to Canadian Agriculture.* AIC Symposium. Charlottetown, P.E.I., June.

Reinbergs, E., 1985. *Cooperative Winter Barley Tests.* Progress Report.

Reinbergs, E. and Hunt, L.A., 1985. *Regional tests in Ontario.* OMAF Progress Rpt.

Ziauddin, A., 1985. *Tissue culture studies in barley (Hordeum vulgare L.) with emphasis on chromosomal variability.* Ph.D. Thesis. Univ. of Guelph.

FORAGES

PERIODICALS

Bowley, S.R., 1985. "Disease and pest resistance ratings of recommended alfalfa cultivars." *OMAF IFIP.*

Busch, L.V., Christie, B.R., Smith, E.A. and Boland, G., 1985. "Testing alfalfa cultivars for resistance to an alfalfa strain of Verticillium albo-atrum." *Can. J. Plant Pathol.* 7: 203-5.

Christie, B.R., Papadopoulos, Y.A. and Busch, L.V., 1985. "Genetics and breeding for resistance to verticillium wilt in alfalfa." *Can. J. Plant Pathol.* 7: 206-10.

Gamble, E.E., 1985. "Potential opportunities for seed crops." *Seeds in Canada, Agri-Book Magazine* 11(2): 25.

McKersie, B.D., 1985. "Effect of pH on proteolysis in ensiled legume forage." *Agron. J.* 77: 81-86.

McKersie, B.D., 1985. "Efficacy of bacterial silage inoculants." *IFIP* 100/52.

BOOKS, THESES, REPORTS

Bowley, S.R., 1985. *1985 summary of alfalfa cultivars currently under test.* Ont. Forage Crops Comm. 148 pp.

Hallem, P.M., Dijak, M. and McKersie, B.D., 1985. *Response to paraquat and freezing by acclimated alfalfa cells.* Can. Soc. Plant Physiol. Ottawa. (Abstr.)

Keith, C., 1985. *Acclimation of callus cultures to freezing stress.* M.Sc. Thesis. Univ. of Guelph.

Navarro-Chavira, G., 1985. *Characterization of flooding injury in alfalfa and birdsfoot trefoil.* Ph.D. Thesis. Univ. of Guelph.

PULSES & OILSEED CROPS

PERIODICALS

Chuong, P.V. and Beversdorf, W.D., 1985. "High frequency embryogenesis through isolated microspore culture in Brassica napus L. and B. carinata Braun." *Plant Sci.* 39: 219-26.

Chuong, P.V. and Beversdorf, W.D., 1985. "High frequency embryogenesis through isolated microspore culture in Brassica napus L. and B. carinata Braun." *Plant Sci.* 39: 219-26.

Chuong, P.V., Pauls, K.P. and Beversdorf, W.D., 1985. "A simple culture method for Brassica protoplasts." *Plant Cell Reports* 4: 4-6.

Erickson, L., Beversdorf, W. and Pauls, P., 1985. "Linear mitochondrial plasmid in Brassica has terminal protein." *Current Genetics* 9: 679-84.

Grant, I. and Beversdorf, W.D., 1985. "Agronomic performance of triazine-resistant single cross hybrid oilseed rape (Brassica napus L.). *Can. J. Plant Sci.* 65: 889-892.

Grant, I. and Beversdorf, W.D., 1985. "Heterosis and combining ability estimates in spring-planted oilseed rape." *Can. J. Genet. Cytol.*: 272-78.

Hoy, D.J. and Gamble, E.E., 1985. "The effects of seed size and seed density on germination and vigor in soybeans (Glycine max. (L.) Merr.). *Can. J. Plant Sci.* 65: 1-8.

Hume, D.J., 1985. "Atrazine registered for use on triazine- resistant canola." *IFIP Agdex* 149/641. May.

Hume, D.J. and Dippel, J.D., 1985. "Harvesting winter rapeseed." *IFIP Agdex* 149/151. June.

Hume, D.J. and Dippel, J.D., 1985. "Swathing spring canola." *IFIP Agdex.* 149/151. June.

Lawn, R.J. and Hume, D.J., 1985. "Response of tropical and temperate genotypes to temperature during early reproductive growth." *Crop Sci.* 24: 137-42.

Smith, D.L. and Hume, D.J., 1985. "Effects of irrigation and fertilizer N on N2 (C2H2) fixation and yield of white bean and soybean." *Can. J. Plant Sci.* 65: 307-16.

PROCEEDINGS

Beversdorf, W.D., 1985. "Genetic engineering for herbicide tolerance." *Proc. Am. Seed Trade Assn. Soybean Conf.* 14: 64-67.

Dippel, J.A. and Hume, D.J., 1985. "Yield and quality effects of harvest method on winter rapeseed and of swathing time on spring canola." *Proc. Can. Soc. Agron. Ann. Mtg.* Charlottetown, P.E.I., June. p. 10. (Abstr.)

Gostick, A.M. and Hume, D.J., 1985. "Selecting for high nitrogen-fixing soybean genotypes." *Proc. Can. Soc. Agron. Ann. Mtg.* Charlottetown, P.E.I., June. p. 1 (Abstr.)

Hume, D.J., 1985. "Effect of storage temperature on performance of Rhizobium japonicum inoculants." *Proc. Am. Soc. Agron. Ann. Mtg.* Chicago, Ill., U.S.A., Dec. p. 157. (Abstr.)

Hume, D.J., 1985. "Soybean cold tolerance." *Proc. Soybean Res. Workshop.* Memphis, TE, Feb. 16 pp.

Hume, D.J., Beversdorf, W.D. and McNalty, G.W., 1985. "Ontario canola research update. II. Winter rapeseed." *Proc. Ont. Canola Conf.* pp. 36-37.

Hume, D.J., Beversdorf, W.D. and McNalty, G.W., 1985. "Ontario canola update. I. Spring canola." *Proc. Ont. Canola Conf.* pp. 2-5.

Hume, D.J., Beversdorf, W.D. and McNalty, G.W., 1985. "Spring Canola - a guide to production." *Proc. Ont. Canola Conf.* Shelburne, March. pp. 1-4.

Michaels, T.E., 1985. "Selection for rapid peanut seedling emergence in Ontario." *A.P.R.E.S. Ann. Conf.* 17: 28. San Antonio, Texas.

BOOKS, THESES, REPORTS

Anderson, T.R. and Beversdorf, W.D., 1985. *Disease tolerance versus resistance: an example from phytophthera root rot of soybeans.* Ann. Mtg. Can. Soc. Agron. June.

Beversdorf, W.D., 1985. *Biotechnology - what is it and what can it do?* Ont. Whitebean Producer Conf. London, Aug.

Beversdorf, W.D., 1985. *Biotechnology in agriculture and forestry.* Biotechnol. Day III. Univ. of Waterloo, Waterloo, Oct.

Beversdorf, W.D., 1985. *Development of Triazine resistance in crops by classical breeding.* WSSA. Seattle, Wash., U.S.A., Feb.

Beversdorf, W.D., 1985. *New varieties and prospects.* SeCan Conf. London, March.

Beversdorf, W.D., 1985. *Protoplast culture and protoplast fusion.* NCR Engineers Biotech. Conf. Univ. of Guelph, June.

Beversdorf, W.D., Erickson, L.R. and Grant, I., 1985. *Patent: Hybridization process utilizing a combination of cytoplasmic male sterility and herbicide tolerance.* USA Patent No. 4,517,763 (Issued May '85) Can. Patent Application S.N. 447,628 (pend.) UK Patent Application S.N. 8404097 (Issued/1985) Australian Patent Application S.N. 14718184 (pending) Fr. Patent (pending).

Beversdorf, W.D. and Hume, D.J., 1985. "Breeding for grain quality." *Applications of Genetic Engineering to Crop Improvement. Eds. G.L. Collins and J.F. Petolino. Amsterdam: Martinus Nijhoff/Dr.W. Junk Publishers. pp. 189-209.*

Cardy, B.L. and Beversdorf, W.D., 1985. Genotypic influences on anther productivity in oilseed rape. Crucifer Improvement Conf. Madison, Wis., U.S.A., May.

Chuong, V.P. and Beversdorf, W.D., 1985. *High frequency embryogenesis from isolated microspores cultures of Brassica napus L. and B. carinata Braun.* Crucifer Improvement Conf. Madison, Wis., May.

Chuong, V.P., Beversdorf, W.D. and Pauls, P., 1985. *A simple method for culturing protoplasts of Brassica napus L.* Brassica Workshop. Saskatoon, Sask., Feb.

Dippel, J.A., 1985. *Yield and quality effects of harvest method on winter rapeseed and of swathing time on spring canola.* M.Sc. Thesis. Univ. of Guelph, May.

Grant, I. and Beversdorf, W.D., 1985. *Application of microspore/anther culture to oilseed rape breeding.* Brassica Workshop. Saskatoon, Sask., Feb.

Grant, I. and Beversdorf, W.D., 1985. *Utilization of anther culture and microspore culture-derived haploids in oilseed rape breeding.* Brassica Biotech. Workshop. Saskatoon, Sask., Feb.

Hume, D.J. and Beversdorf, W.D., 1985. *Soybean report.* Rpt. to the Ont. Oil and Protein Seed Crop Comm. Guelph, Jan. 23 pp.

Hume, D.J. and Beversdorf, W.D., 1985. *Spring canola report.* Rpt. to the Ont. Oil and Protein Seed Crop Comm. Guelph, Jan. 23 pp.

Hume, D.J. and Beversdorf, W.D., 1985. *Winter canola report.* Rpt. to the Ont. Oil and Protein Seed Crop Comm. Guelph, Jan. 19 pp.

Hume, D.J., Beversdorf, W.D., Dekker, J.H. and McNalty, G.W., 1985. *Development of spring and winter canola in Ontario.* Progress Rpt. for New Crops Development Fund. Feb.

Hume, D.J., Montminy, W., Frauley, K., Kutchaw, T., Gostick, A. and Yu, J., 1985. "Effects of seed dressings on nodulation and yield." *Crop Sci. Dept. Ann. Rpt.* pp. 205-8.

Hume, D.J., Montminy, W., Frauley, K., Kutchaw, T., Gostick, A., and Yu, J., 1985. "Soybean production and physiology." *Crop Sci. Dept. Ann. Rpt.* pp. 202-4.

Hume, D.J., Shanmugasundaram, S. and Beversdorf, W.D., 1985. "Soybeans." *Grain Legume Crops.* Eds. R.J. Summerfield and E.H. Roberts. London: Granada Press. pp. 391-432.

Michaels, T.E., 1985. *Field bean breeding progress.* Res. Rpt. to Ont. Field Bean Comm.

Michaels, T.E., 1985. *Peanut breeding progress.* Rpt. to the Oilseeds and Special Crops Subcomm., Exp. Comm. on Grain Breeding.

Michaels, T.E., 1985. *White bean variety and row width update.* Southwestern Ont. Farmer's Wk. Summary. RCAT.

Michaels, T.E., Hough, K. and Smith, T., 1985. *New management systems for white beans.* Dept. of Crop Sci. Ann. Rpt.

Michaels, T.E., Parker, J.P., Hough, K. and Smith, T., 1985. *White bean breeding and evaluation.* Dept. of Crop Sci. Ann. Rpt.

Parker, J.P. and Michaels, T.E., 1985. "Transfer of resistance to common bacterial blight in interspecific crosses between Phaseolus vulgaris L. and P. acutifolius A. Gray." *Crop Sci. Dept. Ann. Rpt.*

Rennie, B.D., Anderson, T.R. and Beversdorf, W.D., 1985. *Disease tolerance versus resistance: an example from Phytophthera root rot of soybeans.* Ann. Mtg. Can. Soc. Agron. June.

Rennie, B.D., Buzzell, R.I. and Beversdorf, W.D., 1985. *Characterizing Rps genes for Phytophthera resistance in three Japanese soybean cultivars.* Am. Soc. Agron. Abstr. p. 67.

Syhes, E.E. and Michaels, T.E., 1985. *Inheritance of oil, fatty acids, and texonomic characters in Ontariogrown peanut crosses (Arachis hypogaea L.).* A.I.C. Conf. Charlottetown, P.E.I.

Winter, J.P., 1985. *Utilization and losses of 14C assimilated in photosynthesis by soybeans grown with these nitrogen sources.* M.Sc. Thesis. Univ. of Guelph, Sept.

VEGETABLES

PERIODICALS

Ayotte, R. and Harney, P.M., 1985. "Interspecific hybridization in Brassica." p. 142. "Embryo rescue in Brassica." p. 142. *Abstrs. in Rpt. of Comm. on Hort. Res.* Can. Hort. Council.

Ayotte, R., Harney, P.M. and Christie, B.R., 1985. "Inheritance of self-incompatibility in rutabaga (Brassica napus L. ssp. rapifera (Metzg. Sinsk.)." *Can. J. Genet. Cytol.* 27(6): 710-15.

Ayotte, R., Harney, P.M. and Souza-Machado, V., 1985. "The production of atrazine-resistant Brassica napus x B. oleracea hybrids." *Cruciferae Newsletter* No. 10, p. 87.

Hale, J.C., Ormrod, D.P., Laffey, P.J. and Allen, O.B., 1985. "Effects of nickel and copper mixtures on tomato in sand culture." *Environ. Pollut.* (Ser. A) 39: 53-69.

MacLeod, K.R. and Ormrod, D.P., 1985. "Responses of white bean to ammonium or nitrate nutrition at three temperatures." *Can. J., Plant. Sci.* 65: 201-205.

Stratigakos, A. and Ormrod, D.P., 1985. "Responses of tomato to sulphur nutrition and SO2." *Water, Air, Soil Pollut.* 24: 19-26.

Tiessen, H., Khosla, S., Fey, F., Jackson, H. and Muller, P., 1985. "Influences of different growing media and root and air temperatures on the production of greenhouse tomatoes." p. 153. *Abstr. in Rpt. of Comm. on Hort. Res.* Can. Hort. Council.

Ziemborska, J.M. and Harney, P.M., 1985. "Production of self-incompatible lines of rutabaga by anther culture of rutabaga-rape hybrids." p. 144. *Abstr. in Rpt. of Comm. on Hort. Res.* Can. Hort. Council.

Zitnak, A., 1985. "Chaconine - Cause of bitterburn in potato tubers." p. 144. *Abstr. in Rpt. of Comm. on Hort. Res.* Can. Hort. Council.

Zitnak, A. and Filadelfi, M.A., 1985. "In vitro thresholds of taste of potato glycoalkaloids." *Can. Inst. Food Sci. Technol. J.* 18: 337-39.

PROCEEDINGS

Bergsma, B.M., Coffin, R. and Svoboda, J., 1985. "Influence of temperature regimes and continuous photoperiod of growth of potatoes at Ellesmere Island (79 degrees N)." *Am. Potato J.* 62(8): 421-22. (Abstr.)

Bergsma, B.M., Coffin, R. and Svoboda, J., 1985. "Small scale cultivation of potato (Solanum tuberosum) at Ellesmere Island (79 degrees N) NWT, Canada." *Program and Abstr, Book for Can. Congress of Bio.*, June. p. CB2.03 (Abstr.)

Souza-Machado, V., Ali, A. and Coffin, R., 1985. "Potato regeneration: A research theme for plant propagation students at Guelph." *Am. Potato J.* 62(8): 440. (Abstr.)

Yada, R., Coffin, R., Stanley, D., Leszkoviat, M. and Fitts, M., 1985. "Effect of sucrose, glucose and fructose content of Ontario-grown potato tubers on chip color." *Am. Potato J.* 62(8): 450-51. (Abstr.)

Yada, R., Coffin, R., Stanley, D. and Leszkoviat, M.J., 1985. "The significance of levels of individual sugars to chipping quality of field harvested and stored potatoes." *Can. Inst. Food Sci. Technol. J.* 18(3): XI. (Abstr.) Paper presented at CIFST meetings in June.

Ziemborska, J.M. and Harney, P.M., 1985. "Production of self-incompatible lines of rutabaga by anther culture of rutabaga-rape hybrids." *Can. Congr. Bio.* Univ. of Western Ont., London. p. GS2.06.

BOOKS, THESES, REPORTS

Charbonneau, P.M., 1985. *Shoot tip culture and inheritance of seed germination and emergence in rutabaga.* M.Sc. Thesis. Univ. of Guelph. Dec.

Coffin, R., 1985. *Genetic engineering, variety development and management profiles.* Michigan Potato Grower's Ann. Mtg. Feb.

Coffin, R., 1985. *Potato cultivars for specific end uses.* OAC Agric. Conf. Jan.

Coffin, R., 1985. *Potato varieties and cultural practices.* Ont. Fieldman's Conf. Jan.

Coffin, R., 1985. *Research and new varieties.* Ont. Seed Growers' Ann. Mtg. Nov.

Coffin, R., 1985. *Unique product items - Yukon Gold potatoes.* Ont. Hort. Crops Conf. Feb.

Coffin, R., 1985. *Varieties - A breeder's view.* Ont. Hort. Crops Conf. Feb.

Desjardins, Y., Tiessen, H. and Harney, P.M., 1985. *The effect of sucrose concentration and Ancymidol on the rooting of asparagus in vitro.* Sixth Intl. Asparagus Symposium. Univ. of Guelph, Aug.

Jamieson, J., Slimmon, T. and Tiessen, H., 1985. *Time required to establish tissue culture clones.* Sixth Intl. Asparagus Symposium. Univ. of Guelph, Aug.

Khosla, S., Tiessen, H. and Mappleback, L., 1985. *Bioassay method for evaluating herbicide residues in established asparagus plantings.* Sixth Intl. Asparagus Symposium. Univ. of Guelph, Aug.

Loughton, A. and Riekels, J.W., 1985. *Cultivar and nutritional aspects of black speck in cauliflower.* Can. Soc. Hort. Sci. Ann. Mtg. Charlottetown, P.E.I.

Slimmon, T., Jamieson, J. and Tiessen, H., 1985. *Multiplication potential tissue cultured asparagus.* Sixth Intl. Asparagus Symposium. Univ. of Guelph, Aug.

Tiessen, H., 1985. *Asparagus varieties in Canada.* B.C. Asparagus Growers' Assn. Vernon, B.C., Dec.

Tiessen, H., 1985. *Canadian asparagus research report 1984-85.* Ann. Asparagus Res. Rpts. to the Res. Comm. of the Can. Food Processors' Assn. and Can. Hort. Council. April. (87 pages).

Tiessen, H., 1985. *Cultivar evaluation in Canada.* Sixth Intl. Asparagus Symposium. Univ. of Guelph, Aug.

Tiessen, H., 1985. *Personal Rpt. to the Ntl. Res. Comm. of the Can. Food Processors' Assn. and Can. Hort. Council,* Ottawa. June.

Tiessen, H., 1985. *Res. Rpt. to the Asparagus Comm. for the Ont. Vegetable Res. Comm.* Univ. of Guelph, Nov.

Tiessen, H., 1985. *Res. Rpt. to the Ont. Asparagus Growers' Assn.*

Tiessen, H., 1985. *Res. Rpt. to the Ont. Vegetable Res. Comm.* Dec.

Tremblay, E.M., 1985. *Air temperature effects on growth and yield of tomato cultivars in an unheated greehouse and controlled environments.* M.Sc. Thesis. Univ. of Guelph, Dec.

TREE FRUITS AND SMALL FRUITS

PERIODICALS

Erf, J.A. and Proctor, J.T.A., 1985. "Cropping influences apple leaf water potential and growth." 82nd Ann. Mtg. Am. Soc. Hort. Sci. *HortScience* 20: 528.

Li, J. and Proctor, J.T.A., 1985. "Simulated pest injury effects photosynthesis and transpiration of apple leaves." *Abstr. in Rpt. of Comm. on Hort. Res.* Can. Hort. Council. p. 153.

Li, J., Proctor, J.T.A. and Murr, D.P., 1985. "Effects of cotyledon removal on apple seedling growth and distribution of 14C-labelled photosynthates." *Can. J. Bot.* 63: 1736-39.

Lougheed, E.C., Miller, S.R., Proctor, J.T.A. and Wiley, L., 1985. "Low-oxygen storage of McIntosh apples." *Abstr. in Rpt. of Comm. on Hort. Res. Can. Hort. Council. p. 154.*

Lougheed, E.C., Proctor, J.T.A. and Wiley, L., 1985. "Low-oxygen storage of Empire, Spartan, Golden Delicious, Delicious and Idared apples." Abstr. in Rpt. of Comm. on Hort. Res. Can. Hort. Council. p. 154.

Lougheed, E.C., Wiley, L. and Proctor, J.T.A., 1985. "Small-scale simulated commercial CA storage rooms." *Proc. 4th Ntl. CA Conf. North Carolina State Univ.*, Raleigh, N.C., July. pp. 235-47.

Strik, B.C. and Proctor, J.T.A., 1985. "Estimating the area of trifoliolate and unequally imparipinnate leaves of strawberry." *HortScience* 20: 1072-74.

ORNAMENTALS

PERIODICALS

Barnett, C.E. and Ormrod, D.P., 1985. "Response of Tilia cordata and Acer Platanoides in pots to nitrogen levels." *HortScience* 20: 283-85.

Eng, R.Y.N., Tsujita, M.J. and Grodzinski, B., 1985. "The effects of supplementary HPS lighting and carbon dioxide enrichment on the vegetative growth, nutritional status and flowering characteristics of chrysanthemum morifolium." *Ramat. J. Hort. Sci.* 6(3): 389-95.

Grodzinski, B. and Tsujita, M.J., 1985. "CO2 enrichment of ornamentals in greenhouses." *Can. Florist* 80(2): 35-36.

Grodzinski, B., Tsujita, M.J., Butt, J. and Woodrow, L., 1985. "CO2 enrichment: an old practice for today's greenhouses." *Highlights Agri. Res. Ont.* 8(3): 11-14.

Harney, P.M., 1985. "Ontario Two Hundred' geranium." *Can. J. Plant Sci.* 65: 1089-90.

Hildebrandt, V. and Harney, P.M., 1985. "In vitro propagation of Euonymus fortunei." *The Plant Propagator* 31(2): 9-11.

Hildebrandt, V. and Harney, P.M., 1985. "In vitro propagation of Viburnum opulus 'Nana'." *J. Environ. Hort.* 3(2): 41-45.

Hildebrandt, V. and Harney, P.M., 1985. "The effect of adsorbents on exudate from geraniums." p. 146. "The identity of exudate from tissue cultured geraniums." p. 146. The inhibitory effect of exudate from tissue cultured geraniums." p. 147 *Abstrs. in Rep. of Comm. on Hort. Res.* Can. Hort. Council.

Johnson, A.G. and Lumis, G.P., 1985. "High temperatures in containers." *Landscape Ont.* 13(1): 10-11.

Lumis, G.P., 1985. "Stimulating root regeneration in newly transplanted landscape trees." *Highlights agric. res. Ont.* 8(4): 7-10.

Lumis, G.P. and Johnson, A.G., 1985. "Fertilizers for container-grown Hicks yew." *Landscape Ont.* 13(2): 12-13.

Lumis, G.P. and Johnson, A.G., 1985. "Nutricote for container-grown nursery stock." *Landscape Trades* 7(2): 7-9, 11.

Tsujita, M.J., Butt, J. and Dutton, R., 1985. "Light and CO^2 studies on roses." *Flowers Canada News.* Mar.

BOOKS, THESES, REPORTS

Hildebrandt, V., 1985. *The chemical nature and control of the growth inhibiting exudate from explants in the vitro culture of Pelargonium x hortorum Bailey 'Sprinter Scarlet.'* Ph.D. Thesis.Univ. of Guelph, Sept.

WEEDS

PERIODICALS

Anderson, G.W., 1985. "Annual weed control in establishing alfalfa." p. 4. "Annual weed control in triazine tolerant spring canola." p. 328. "Bromoxynil and chlorsulfuron on Woodstock oats." p. 37. *Abstrs. in Exp. Comm. on Weeds, Res. Rpt.:* East. Sect.

Anderson, G.W., 1985. "AC 263,499 and AC 252,214 and combinations, preemergence for soybean weed control." p. 171. "AC 263,499 for weed control in established Alfalfa." p. 2 *Abstrs. in Exp. Comm. on Weeds, Res. Rpt.:* East. Sect.

Anderson, G.W., 1985. "Bromoxynil and MCPA for horsetail control in corn." p. 86. "Herbicide combinations for soybean weed control." p. 170. "Herbicides for broadleaf weed control in establishing alfalfa." p. 3. *Abstrs. in Exp. Comm. on Weeds, Res. Rpt.:* East. Sect.

Anderson, G.W., 1985. "Chlorsulfuron for dandelion control in established alfalfa and birdsfoot trefoil." *Exp. Comm. on Weeds, Res. Rpt.:* East. Sect. p. 5.

Anderson, G.W., 1985. "Herbicides on Leger barley." p. 35. "Herbicide trials on oats and barley." p. 38. "Emergence of quackgrass shoots after placement of rhizomes at various depths in the soil." p. 526.*Abstrs. in Exp. Comm. on Weeds, Res. Rpt.:* E[illegible]ect.

Anderson, G.W., 1985. "Lambsquarters control with E1-107." p. 35. "PPI and preemergence treatments for annual weed control in corn." p. 82. "PPI and preemergence treatments for annual weed control in soybeans." p. 172. *Abstrs. in Exp. Comm. on Weeds, Res. Rpt.:* East Sect.

Anderson, G.W., 1985. "Proso millet control in corn." p. 85. "Postemergence combinations for soybeans." p. 174. "Postemergence graminocides + broadleaf herbicides for soybeans." p. 173. *Abstrs. in Exp. Comm. on Weeds, Res. Rpt.:* East Sect.

Anderson, G.W., 1985. "Quackgrass control in winter rapeseed." p. 330. "Triazine resistant lambsquarters control in corn." pp. 83-84. "Winter wheat control in winter rapeseed." p. 329. *Abstrs. in Exp. Comm. on Weeds, Res. Rpt.:* East Sect.

Anderson, G.W., 1985. "Quackgrass control with glyphosate before soybeans." p. 176. "Quackgrass control with postemergence treatments in soybeans." p. 175. "Quackgrass control in triazine tolerant spring canola." p. 327. *Abstrs. in Exp. Comm. on Weeds, Res. Rpt.:* East Sect.

Anderson, G.W., 1985. "Winter wheat tolerance to herbicides." p. 39. *Abstr. in Exp. Comm. on Weeds, Res. Rpt.:* East. Sect.

Ayotte, R., Harney, P. and Souza Machado, V., 1985. "The production of atrazine resistant Brassica napus and B. oleracea hybrids." *Cruciferae Newsletter* #10: 87.

Cain, N.P., 1985. "Chlorthal dimethyl control of dwarf snapdragon in strawberries." p. 467. "Control of Carex trisperma sedge in established cranberries." p. 477.*Exp. Comm. on Seeds, Res. Rpt.:* East Sect.

Cain, N.P., 1985. "Control of rice cut-grass in cranberries." p. 477. "Control of various sedges in established cranberries." p. 478. "Herbicides for weed control in cranberries." p. 479. *Exp. Comm. on Weeds, res. Rtp.:* East. Sect.

Cain, N.P., 1985. "Fusilade injury of a Juniper cultivar." p. 366. "Weed control in Juniper and Spirea container nursery stock." p. 366. *Exp. Comm. on Weeds, Res. Rpt.:* East. Sect.

Cain, N.P., 1985. "Strawberry cultivar response to dicamba." *Exp. Comm. on Weeds, Res. Rpt.: East. Sect.* p. 468.

Christensen, K., Smith, B., Ali, A. and Souza Machado, V., 1985. "Atrazine tolerant Russian thistle." *Exp. Comm. on Weeds (EC).* p. 639.

Ezra, G., Chandler, K. and Stephenson, G.R., 1985. "BAS 4 85 43 fl 84-2 plus tridiphane for proso millet control in corn." *Exp. Comm. on Weeds, res. Rpt.: East. Sect.* p. 104.

Ezra, G., Dekker, J.H. and Stephenson, G.R., 1985. "Tridiphane as a synergist for herbicides in corn (Zea mays) and proso millet (Panicum miliaceum)." *Weed Sci.* 33: 287-90.

Ezra, G., Rusness, D.G., Lamoureaux, G.L. and Stephenson, G.R., 1985. "The effect of CDAA (N,N,-Diallyl-2-chloroacetamide) pretreatments on subsequent CDAA injury to corn Zea mays L.)." *Pestic. Biochem. Physiol.* 23: 108-115.

Ezra, G. and Stephenson, G.R., 1985. "Comparative metabolism of atrazine and EPTC in proso millet (Panicum milliaceum L.) and corn." *Pestic. Biochem. Physiol.* 24:207-212.

Fletcher, R.A. and Hofstra, G., 1985. "Triadimefon, a plant multiprotectant." *Plant and Cell Physiol.* 26: 238-243.

Lee, J.P. and Stephenson, G.R., 1985. "Trifluralin and clopyralid interactions in spring wheat." *Exp. Comm. on Weeds, res. Rpt.: East. Sect.* p. 840.

McQuarrie, P., McLeod, J.E., Horton, R. and Stephenson, G.R., 1985. "The influence of plant age on tomato tolerance to Metribuzin." *Proc. Br. Crop Prot. Conf. - Weeds* 3 (9B-5): 1179-85.

Shattuck, V., Souza Machado, V. and Tomlinson, J.A., 1985. "Turnip mosaic virus in rutabaga." *Cruciferae Newsletter* #10: 119.

Souza Machado, V., Shupe, J. and Keller, W.A., 1985. "Cytoplasmic inherited atrazine resistance transmitted through another culture in rutabaga." *A. Pflanzensuchtung* 95: 179-84.

Turnbull, G.C. and Stephenson, G.R., 1985. "Translocation of clopyralid and 2,4-D in Canada thistle (Cirsium arvense)." *Weed Sci.* 33: 143-147.

PROCEEDINGS

Fletcher, R.A., Hofstra, G., Arnold, V. and Abbas, S., 1985. "Plant growth regulating properties of triadimefon." *Am. and Can. Soc. Plant Physiol. Mtgs.* Univ. of Rhode Island, Kingston, Rhode Island, U.S.A. p. 127.

Grier, R., Fletcher, R.A. and Souza Machado, V., 1985. "Triadimefon - a potential protectant for metribuzin in direct seeded tomatoes." *Weed Sci. Soc. Am.* p. 72 (Abstr.)

BOOKS, THESES, REPORTS

Fletcher, R.A., 1985. "Plant growth regulating properties of sterol inhibiting fungicides." *Hormonal Regulation of Plant Growth and Development*, Vol. 2. Ed. S. S. Purohit. Agro Botanical Publishers, pp. 103-13.

INSECTS

PERIODICALS

Baker, C.J. and Laing, J.E., 1985. "Competition between Diadegma insulare (Cress.) (Hymenoptera: Ichneumonidae) & Microplitis plutellae Mues. (Hymenoptera: Braconidae) for larvae of the diamondback moth Plutella xylostella (L.) (Lep.: Plut.)." *Proc. Ent. Soc. Ont.* 114: 1-10. 1983. (published in 1985).

MacDonald, R.S., Soloman, K.R., Surgeoner, G.A. and Harris, C.R., 1985. "Laboratory studies on the mechanisms of resistance to permethrin in a field selected strain of house flies." *Pesticide Sci.* 16: 10-16.

Marshall, S.A., 1985. "A revision of the Nearctic Spelobia." *Trans. Am. Entomol. Soc.* 111: 1-101.

Piedrahita, O., Ellis, C.R. and Allen, O.B., 1985. "Effect of spacing and clumping of corn plants on density of corn rootworm larvae (Coleoptera: Chrysomelidae) per root system." *Can. Entomol.* 117: 139-42.

Piedrahita, O., Ellis, C.R. and Bogart, J.P., 1985. "Electrophoretic indentification of the larvae of Diabrotica barberi and D. virgifera virgifera (Coleoptera: Chrysomelidae)." *Ann. Entomol. Soc. Am.* 78: 537-40.

Piedrahita, O., Ellis, C.R. and Bogart, J.P., 1985. "Interaction of northern and western corn rootworm larvae (Coleoptera: Chrysomelidae) in a controlled environment." *Environ. Entomol.* 14: 138-41.

Ritcey, G. and McEwen, F.L., 1985. "Pesticides for onion maggot control." p. 140. *Abstr. in Rpt. of Comm. on Hort. Res.* Can Hort Council.

Ritcey, G., McEwen, F.L., Frank, R. and Ripley, B., 1985. "Minor crops, fungicide residues." p. 140 *Abstr. in Rpt. of Comm. on Hort. Res.* Can. Hort. Council.

Ritcey, G., McEwen, F.L., Frank, R., Braun, H.E. and Ripley, B., 1985. "Residues in carrots." *Abstr. in Rpt. of Comm. on Hort. res.* Can. Hort. Council.

Ritcey, G., McEwen, F.L., Frank, R. and Braun, H.E., 1985. Captan residue in raspberry fruit, p. 140. Dimethoate residue in eggplant, p. 140. Insecticide residues on celery, p. 140. Pesticide residue in onions as a result of foliar treatment, p. 140. *Abstrs. in Rpt. of Comm. on Hort. Res.* Can. Hort. Council.

Ritcey, G., McEwen, F.L., Frank, R. and Ripley, B., 1985. Fungicide residue in onions and soil, p. 140. *Abstr. in Rpt. of Comm. on Hort. Res.* Can. Hort. Council.

Ritcey, G., McEwen, F.L., Valk, M. and Knibbe, E., 1985. "Pesticides for onion maggot and smut control — precision seeding." *Abstr. in Rpt. of Comm. on Hort. Res.* Can. Hort. Council.

Sears, M.K. and McGraw, R.R., 1985. "Control of potato leafhopper with foliar-applied insecticides on potatoes." p. xx. "Control of Colorado potato beetles and tarnished plant bugs with foliar-applied insecticides on potatoes." p. xx. *Pesticide Res. Rpts. in Exp. Comm. on Pesticide Use in Agric.*

Teal, P.E.A., 1985. "The effect of hybridization on the periodicity of sex pheromone release of Euxoa species (Lepidoptera: Noctuidae)." *Physiol. Entomol.* 10: 463-66.

Teal, P.E.A., Mitchell, E.R., Tumlinson, J.H., Heath, R.R. and Sugie, H., 1985. "Identification of a volatile blend of sex pheromone components released by the southern armyworm, Spodoptera eridania (Cramer)." *J. Chem. Ecol.* 11: 717-25.

Teal, P.E.A., Tumlinson, J.H. and Heath, R.R., 1985. "Chemical and behavioral analysis of volatile sex pheromone components released by calling Heliothis virescens (F.) females (Lepidoptera: Noctuidae)." *J. Chem Ecol.* 12: 110-29.

Teal, P.E.A., West, R.J. and Laing, J.E., 1985. "Identification of a blend of sex pheromone components of the potato stem borer (Lepidoptera: Noctuidae) for monitoring adults." *Proc. Entomol. Soc. Ont.* 114: 15-19. 1983. (published in 1985).

West, R.J. and Laing, J.E., 1985. "Development of the potato stem borer, Hydraecia micacea (Esper) in the laboratory and the field." *Proc. Entomol. Soc. Ont.* 115: 81-87. 1984. (published in 1985).

West, R.J., Laing, J.E. and Marshall, S.A., 1985. "Parasites of the potato stem borer, Hydraecia micacea (Lepidoptera: Noctuidae)." *Proc. Entomol. Soc. Ont.* 114: 69-82. 1983. (published in 1985).

West, R.J., Laing, J.E. and Teal, P.E.A., 1985. "A method of rearing the potato stem borer, Hydraecia micacea (Esper) (Lepidoptera: Noctuidae) in the laboratory." *J. Econ. Entomol.* 78: 219-21.

Wukasch, R.T., 1985. "Alfalfa weevil - biocontrol." *OMAF Press Service.* July 12.

Wukasch, R.T., 1985. "Costs of weed control." *Western Ontario Farmer.* Sept. 25.

Wukasch, R.T., 1985. "Diseases of winter wheat." *Western Ontario Farmer.* Listowel. July 12.

PROCEEDINGS

Ellis, C.R. and Beattie, B., 1985. "Effect of banding and incorporation on the efficacy of granular insecticides for control of corn rootworms (Coleoptera: Chrysomelidae) in grain corn." *Proc. Ent. Soc. Ont.* 115: 31-36. 1984. (published Dec. 1985).

Marshall, S.A., 1985. "A revision of the New World species of Minilimosina Rohacek (Diptera: Sphaeroceridae)." *Proc. Ent. Soc. Ont.* 116: 1-60.

Marshall, S.A., 1985. "The genera Xenolimosina and Terrilimosina (Diptera: Schaeroceridae) in North America." *Proc. Ent. Soc. Wash.* 87: 759-69.

BOOKS, THESES, REPORTS

Attwater, W.A., 1985. *Apple Maggot.* EB 85 164. Dec. Dept. of Environmental Biology, Univ. of Guelph.

Attwater, W.A., 1985. *Boxelder Bugs and Other Occasional True Bugs in the Home.* EB 85 28. Feb. Dept. of Environmental Biology, Univ. of Guelph.

Burns, E., 1985. *Oak Skeletonizer.* EB 85 169. Dec. Dept. of Environmental Biology, Univ. of Guelph.

Goble, H.W., Attwater, W.A. and Wukasch, R.T., 1985. *Cluster Flies.* EB 85 31. Revised. Dec. Dept. of Environmental Biology, Univ. of Guelph.

Kelly, C.B., 1985. *Apple Scab.* EB 85 172. Dec. Dept. of Environmental Biology, Univ. of Guelph.

Kelly, C.B., 1985. *Compost Pile in Your Garden.* EB 85 07. Revised, Mar. Dept. of Environmental Biology, Univ. of Guelph.

Kelly, C.B., 1985. *Diseases and pests in the garden.* Orillia Hort. Soc. Orillia, April.

Kelly, C.B., 1985. *Diseases of trees and shrubs.* Guelph Township Hort. Soc. Marden, April.

Kelly, C.B., 1985. *Potato Scab.* EB 85 165. Dec. Dept. of Environmental Biology, Univ. of Guelph.

Kelly, C.B., 1985. *Some Publications on Weed Identification.* EB 85 06. Revised, Dec. Dept. of Environmental Biology, Univ. of Guelph.

Kelly, C.B. and Attwater, W.A., 1985. *Maple Petiole Borer.* EB 85 22. Revised, June. Dept. of Environmental Biology, Univ. of Guelph.

Killins, R. and Wukasch, R.T., 1985. *Virus Diseases in the Home Garden.* EB 85 167. Dec. Dept. of Environmental Biology, Univ. of Guelph.

Louter, J. and Wukasch, R.T., 1985. *Vascular Wilt Diseases in the Home Garden.* EB 85 166. Dec. Dept. of Environmental Biology, Univ. of Guelph.

MacDonald, R.S., 1985. *Impact of the cabbage maggot, Delia radicum (L.) (Diptera: Anthomyiidae) on canola, Brassical campestris L., in north-central Alberta.* M.Sc. Thesis. Univ. of Guelph, May.

Mohr, N.A., 1985. *Dealing With Stinging Insects.* EB 85 168. Dec. Dept. of Environmental Biology, Univ. of Guelph.

Ritcey, G. and McEwen, F.L., 1985. *Pesticides for onion maggot control.* Pesticide Res. Rpt., Exp. Comm. on Pesticide Use in Agric.

Ritcey, G., McEwen, F.L., Frank, R. and Ripley B., 1985. *Minor crops, fungicide residues.* Pesticide Res. Rpt. Exp. Comm. on Pesticide Use in Agric.

Ritcey, G., McEwen, F.L., Frank, R. and Braun, H.E., 1985. *Minor crops, insecticide residues. Residues in carrots. Pesticide Res. Rpts., Exp. Comm. on Pesticide Use in Agric.*

Ritcey, G., McEwen, F.L., Valk, M. and Knibbe, E., 1985. Pesticides for onion maggot and smut control - precision seeding. Pesticide Res. Rpt., Exp. Comm. on Pesticide Use in Agric.

BOOKS, THESES, REPORTS

Surgeoner, G.A., 1985. *Integrated pest management of dairy pests.* Bovine Practitioners Conf. Buffalo, N.Y., Nov.

Surgeoner, G.A., 1985. *Management of resistance in the house fly.* Poultry Pest Control Symposium. Hollywood, Florida, Dec.

Thompson, C.L. and Attwater, W.A., 1985. *Plant Bugs.* EB 85 170. Dec. Dept. of Environmental Biology, Univ. of Guelph.

Wukasch, R.T., 1985. *Diagnosis of tree problems and operation of the Pest Diagnostic and Advisory Clinic.* 53-427 Arboriculture Course. Guelph, Nov.

Wukasch, R.T., 1985. *Garlic diseases and insect pests.* OMAF Garlic Information Day. Simcoe, Sept.

Wukasch, R.T., 1985. *Ornamental pest identification.* Landscape Ont., Professional Sprayers Commodity Group. Guelph, Nov.

Wukasch, R.T., 1985. *Pest Diagnotic and Advisory Clinic - function and services.* Ont. Min. Env. Provincial Pesticide Staff Mtg. Guelph, April.

Wukasch, R.T., 1985. *Pest Diagnostic and Advisory Clinic - operation and services.* OAC Ext. Comm. Guelph, Sept.

Wukasch, R.T., 1985. *Pests and diseases of asparagus.* OMAF Asparagus Specialist Mtg. Guelph, May.

Wukasch, R.T., 1985. *Principles of Pest Indentification.* EB 85 162. Dec. Dept. of Environmental Biology, Univ. of Guelph.

Wukasch, R.T., 1985. *References Useful for the Identification of Fruit Pests.* EB 85 163. Dec. Dept. of Environmental Biology, Univ. of Guelph.

Wukasch, R.T., 1985. *References Useful for the Identification of Pests and Diseases of Trees.* EB 85 125. Revised, Dec. Dept. of Environmental Biology, Univ. of Guelph.

Wukasch, R.T., 1985. *Weed seeding identification.* OMAF Weed Inspectors Conf. Guelph, May.

PLANT DISEASES

PERIODICALS

Barron, G.L., 1985. "A new Gonimochaete and its sexual state." *Mycologia.* 77: 17-23.

Bonn, W.G., Gitaitis, R.D. and MacNeill, B.H., 1985. "Epiphytic survival of Pseudomonas syringae pv. tomato on tomato transplants shipped from Georgia." *Plant Disease* 69: 58-60.

McFadden, W. and Hall, R., 1985. "Assessment of root rot potential of white bean fields in southwestern Ontario." *Ann. Rpt. Bean Imp. Coop.* 28: 127-28.

Sutton, J.C., 1985. "Effectiveness of fungicides for managing foliar diseases and promoting yields of Ontario winter wheat." *Phytoprotection* 66: 141-52.

Sutton, J.C. and Hildebrand, P.D., 1985. "Environmental water in relation to Peronospora destructor and related pathogens." *Can. J. Plant Pathol.* 7: 323-30.

Sutton, J.C. and Turek, R., 1985. "Effectiveness of seed treatments for managing take-all in winter wheat." *Exp. Comm. on Pesticide Use in Agric., Pesticide Res. Rpt.*

PROCEEDINGS

Nelson, K. and Sutton, J.C., 1985. "Management of eyespot on winter wheat in Ontario." *Proc. 45th Ann. Mtgs. Northeast. Div. Am. Phytopathol. Soc.* p. 33.

Peever, T. and Sutton, J.S., 1985. "An apparatus for studying temperature and water potentials in relation to survival of Botrytis cinerea in dead strawberry leaves." *"Proc. 45th Ann. Mtgs. Northeast. Div. Am. Phytopathol. Soc.* p. 35.

BOOKS, THESES, REPORTS

Burpee, L.L., Kaye, L.M., Goulty, L.G. and Lawton, M.B., 1985. "Biological control of grey snow mold on creeping bentgrass." *Turfgrass Res. Ann. Rpt.* Ed. L. L. Burpee. Univ. of Guelph.

Edgington, L.V. and Hamilton, J., 1985. *The efficacy of seed treatments for control of powdery mildew of barley.* Pesticide Res. Rpt.

Edgington, L.V., Hamilton, J.R. and Burbidge, H., 1985. *Fungicidal control of Botrytis Blight in onion.* Pesticide Res. Rpt.

Edgington, L.V., Martin, R.A. and Hamilton, J., 1985. *The effect of seed treatments of loose smut on barley.* Pesticide Res. Rpt.

Jesperson, G.D., 1985. *Management of onion downy mildew with fungicides times according to weather conditions.* M.Sc. Thesis. Univ. of Guelph, June.

Kaye, L.M., 1985. *Effect of ammonium salts and microbial antagonists on plant pathogenic Typhula spp.* M.Sc. Thesis. Univ. of Guelph, Sept.

McFadden, W., 1985. *Prediction and control of bean root rot.* M.Sc. Thesis. Univ. of Guelph.

Nelson, K. and Sutton, J.C., 1985. "Evaluation of fungicides for managing take-all of winter wheat." *Proc. East. (Canada) Cerealists.* Ottawa.

Nelson, K. and Sutton, J.C., 1985. Foliar fungicides for managing eyespot in winter wheat. *Proc. Ont. Crop Prot. Conf.*

Sutton, J.C., James, T.D.W. and Rowell, P.M., 1985. *BOBCAST — A Forecaster for Timing Fungicides to Control Botrytis Leaf Blight of Onions.* Univ. of Guelph Circular EB 07 85 (Rev.)

AGRICULTURAL ENGINEERING

PERIODICALS

Ogilvie, J.R. and Trueman, E.J., 1985. "Heat exchangers and ventilation." *Farm Builder of Canada.* 1: 10-12.

PROCEEDINGS

Bilanski, W.K., Graham, V.A. and Hanusiak, J.A., 1985. "Mechanics of bulk forage deformation with application to wafering." *Trans. Am. Soc. Agric. Engng.* 28(3): 697-702.

Bilanski, W.K., Mowat, D.W. and Wilton, B., 1985. "Physical properties of alfalfa stems and leaves affecting their aerodynamic separation." *Proc. 3rd. Intl. Conf. on Physical Properties of Agric. Materials.* Prague, Czechoslovakia. pp. 51-56.

Brunet, L.M. and Jofriet, J.C., 1985. "Measured wall pressures in a bottom-unloading silo." *Ann. Mtg. North America Region, ASAE.* Paper No. 85-411. Univ. of Baltimore, Baltimore, Md., U.S.A.

Graham, V.A. and Bilanski, W.K., 1985. "Deformation mechanics of loose and consolidated forages." *Proc. 10th Can. Congress of Appl. Mechanics* 1: A39-40. London.

Jones, D.R. and Bilanski, W.K., 1985. "Fractionization of mature whole-plant corn silage." *Proc. Forage and Grasslands Conf.* Hershey, Pa., U.S.A. pp. 279-82.

Ogilvie, J.R. and Boyd, K.G., 1985. "Tracer gas analysis of ventilation due to wind in models of a modified open front (MOF) swine finishing barn." *Can. Soc. Agric. Engng.* Charlottetown, P.E.I. Paper No. 85-413.

Otten, L. and Brown, R.B., 1985. "A single layer drying equation for white beans." *Proc. 3rd. Intl. Conf. on Physical Properties of Agric. Materials and their Influence on Design and Performance of Agric. Machines and Technologies.* Prague, Czechoslovakia, Aug. pp. 671-75.

Pos, J., 1985. "Research in biogas production - conventional and porous media digesters." *Proc. Condensed Papers 7th Miami Intl. Conf. on Alternative Energy Sources.* Miami Beach, FL., Dec. pp. 745-46.

Pos, J., Eszes, R. and Pavlicik, V., 1985. "Evaluation of two full-size mixed mesophilic digesters processing swine manure." *Proc. 5th Int. Symp. on Agric Waste.* Dec. pp. 81-90.

BOOKS, THESES, REPORTS

Boyd, K.G., 1985. *Experimental analysis of ventilation due to wind in models of a modified open front (MOF) swine finishing barn.* M.Sc. Thesis. Univ. of Guelph.

Brunet, L.M., 1985. *Full scale investigation of wall and floor pressures in a bottom unloading silo.* M.Sc. Thesis. Sch. Engng., Univ. of Guelph.

Eszes, S.W. and Pos, J., 1985. *Investigation into the production of electricity utilizing a high compression diesel engin/induction motor set running on biogas diesel fuel mixture.* Final Rpt. for Energy Branch, OMAF. July.

Farazdaghi, H., Ketcheson, J.W. and Lee, J.H.A., 1985. *A model for the effects of tillage practices and weather variations on corn grain yield.* ASAE Paper NAR85-108. Baltimore, Md., U.S.A.; (ISTRO 10th Intl. Conf. Guelph, July;) and (CSAE 2nd poster paper report. Guelph, May.)

Farazdaghi, H. and Ogilvie, J.R., 1985. *Machinery management program.* CSAE 2nd poster paper report. Guelph, May.

Harrold, R., 1985. *Study of flow patterns in a naturally-ventilated single slope modified open front (MOF) swine barn.* Co-op work report. Univ. of Guelph.

Ogilvie, J.R. and Trueman, E.J., 1985. *Analysis of interconnected heat exchangers and ventilation systems.* Final Rpt. to Ont. Pork Producers Mktg. Board, Nov. 1983-Nov. 1985. Sch. Engng., Univ. of Guelph. Guelph.

STREAMWATER MANAGEMENT

PERIODICALS

Kaushik, N.K., Stephenson, G.L., Solomon, K.R. and Day, K.E., 1985. "Impact of permethrin on zooplankton communities using limnocorrals." *Can. J. Fish. Aquat. Sci.* 42(1): 77-85.

Solomon, K.R., Yoo, J.Y., Lean, D., Kaushik, N.K., Day, K.E. and Stephenson, G.L., 1985. "Dissipation of permethrin in limnocorrals." *Can. Fish. Aquat. Sci.* 42(1): 70-76.

BOOKS, THESES, REPORTS

Herman, D.C., 1985. *Impact of enclosure and of atrazine on periphyton.* M.Sc. Thesis. Univ. of Guelph.

LAND USE

PERIODICALS

Johnston, T. and Smit, B., 1985. "An evaluation of the rationale for farmland preservation policy in Ontario." *Land Use Policy* 2(3): 225-37.

Protz, R., Ross, G.J. and Shipitalo, M.J., 1985. "The influence of texture on clay weathering and soil formation in Mid-Northern Ontario." *Applied Clay Sci.* 1: 43-55.

Smit, B., Brklacich, M., Schildroth, J. and Phillips, T., 1985. "The capacity of Ontario's land base to accommodate growth in the agri-food sectors." *J. Resource Mgmt. Opt.* 3(3): 185-207.

PROCEEDINGS

Brklacich, M., Smit, B. and McBride, R., 1985. "Application of land evaluation techniques to environmental change issues: the case of land drainage and food production." *Progr. Abstrs., Intl. Conf. on Mgmt. Rural Resources.* Univ. of Guelph, July. p. 43.

Johnston, T., 1985. "Land rating for agricultural land planning: A critique of conventional methods." *Prog. Abstrs., Conf. Mgmt. Rural Resources.* Univ. of Guelph, July. p. 38.

Protz, R. and Shipitalo, M.J., 1985. "Soil fabric - a cast of millions." *Can. Congr. Bio.* London, June. *Abstr. in Program and Abstract Book*, p. S1.04.

BOOKS, THESES, REPORTS

Brown, D.M. and Place, R.E., 1985. *Land rating for horticultural crops based on climatic conditions in southwestern Ontario.* Intl. Conf. on Mgmt. of Rural Resources: Problems and Policies. Guelph, July.

Fischer, J. and Protz, R., 1985. *Evaluation of Airborne Multispectral Electrical-optical Imaging Scanner II (MEIS II) and Landsat Thematic Mapper for detailed soil surveys.* Tech. Memo. 85-1. Dept. of Land Resource Sci., Univ. of Guelph.

Gray, E.C., 1985. *Farm real estate prices in central-north Kent and northern Huron Counties (Ontario) since the early 1800's.* AEEE/85. Univ. of Guelph.

Keddie, P.D. and Mage, J.A., 1985. *Southern Ontario Atlas of Agriculture.* Dept. of Geography, Univ. of Guelph. Occasional Papers in Geography, No. 7. 85 pp.

Mage, J.A., 1985. "Absentee ownership of Ontario farmland." *Farming and the Rural Community in Ontario.* Ed. A.M. Fuller. Toronto: Foundation for Rural Living. pp. 197-218.

Mage, J.A., 1985. *Appendix to the Agridata Manual.* Dept. of Geography, Univ. of Guelph, Feb. 40 pp.

Nickling, W.G. and FitzSimons, J.G., 1985. "Relationship of soil type and agricultural systems to wind erosion in southwestern Ontario." *Soil Erosion and Conservation.* Eds. S. A. El-Swaify, W. C. Moldlenhauer and A. Lo. Soil Conservation Soc. Am. pp. 34-50.

Smit, B.E., Rodd, R.S., Bond, D.M., Brklacich, M.J., McBride, R.A. and et al., 1985. *Analysis of the Production Possibilities of Ontario Agriculture*, Vol. II: *Prospects for growth in Ontario's Agri-Food Sector Under Alternative Conditions of Supply and Demand.* Univ. of Guelph. USRP & D Pub. No. LEG-18. 56 pp.

Smit, B.E., Rodd, R.S., Bond, D.M., Brklacich, M.J., McBride, R.A. and et al., 1985. *Analysis of the Production Possibilities of Ontario Agriculture: Executive Summary.* Univ. of Guelph. USRP & D Pub. No. LEG-19. 13 pp.

Smit, B.E., Rodd, R.S., Bond, D.M., Brklacich, M.J., McBride, R.A. and

et al., 1985. *Socio-Economic Assessment of the Implications of Climatic Change for Food Production in Ontario.* Univ. of Guelph. USRP & D Pub. No. LEG-22. 114 pp.

Yin, Y.Y., 1985. *Implications of soil erosion for future food production.* M.A. Thesis. Univ. of Guelph, Aug.

CROP & SOIL MANAGEMENT

PERIODICALS

Bhatnagar, V.K. and Miller, M.H., 1985. "Sorption of carbon and phosphorus from liquid manure by soil aggregates of differing size." *Can. J. Soil Sci.* 65: 467-73.

Bhatnagar, V.K., Miller, M.H. and Ketcheson, J.W., 1985. "Reaction of fertilizer and liquid phosphorus with soil aggregates and sediment phosphorus enrichment." *J. Environ. Qual.* 14: 246-51.

Clothier, B.E. and Elrick, D.E., 1985. "Solute dispersion during axisymmetric three-dimensional, unsaturated water flow." *Soil Sci. Soc. Am. J.* 49: 552-56.

Grant, C.D., Kay, B.D., Groenvelt, P.H., Kidd, G.E. and Thurtell, G.W., 1985. "Spectral analysis of micropenetrometer data to characterize soil structure." *Can. J. Soil Sci.* 65: 789-804.

Irwin, R.W., 1985. "Drainage benefit measured." *Drainage Contractor* 11(1): 34-35.

Kay, D.B., Grant, C.D. and Groenevelt, P.H., 1985. "Significance of ground freezing on soil bulk density under zero tillage." *Soil Sci. Soc. Am. J.* 49: 973-78.

Kay, B.D., Grant, C.D. and Groenevelt, P.H., 1985. "The significance of ground freezing on the bulk densities of soil under zero and conventional tillage treatments." *Soil Sci. Soc. Am. J.* 49: 973-78.

Lee, D.M., Clothier, B.E., Elrick, D.E. and Reynolds, W.D., 1985. "A comparison of three techniques for measuring saturated hydraulic conductivity in the field." *Can. J. Soil Sci.* 65: 563-73.

Miller, M.H., Robinson, J.B. and Gillham, R.W., 1985. "Self-sealing of earthen manure storage ponds. I. A case study." *J. Envir. Qual.* 14: 533-38.

Reynolds, W.D., Elrick, D.E. and Clothier, B.E., 1985. "Reply to 'Comments on a re-examination of the constant head well permeameter method for measuring saturated hydraulic conductivity above the water table' by Daniel B. Stephens." *Soil Sci.* 139: 192.

Reynolds, W.D., Elrick, D.E. and Clothier, B.E., 1985. "The constant head well permeameter: Effect of unsaturated flow." *Soil Sci.* 139: 172-80.

Richards, J.E., Bates, T.E. and Sheppard, S.C., 1985. "The effect of broadcast P applications and small amounts of fertilizer placed with the seed on continuously cropped corn (Zea Mays L.)." *Fertilizer Res.* 6: 269-72.

Robin, M.J.L. and Elrick, D.E., 1985. "Effect of cation exchange on calculated hydrodynamic dispersion coefficients." *Soil Sci. Soc. Am. J.* 49: 39-45.

Rowsell, J.G., Miller, M.H. and Groenevelt, P.H., 1985. "Self-sealing of earthen manure storage ponds. II. Rate and mechanism of sealing." *J. Environ. Qual.* 14: 533-38.

Rowsell, J.G., Miller, M.H. and Groenevelt, P.H., 1985. "Self-sealing of earthen manure storage ponds. II. Rate and mechanism of sealing as influenced by soil texture and hydraulic head." *J. Environ. Qual.* 14: 539-43.

Soon, Y.K. and Bates, T.E., 1985. "Molybdenum, cobalt and boron uptake from sewage sludge-amended soils." *Can. J. Soil Sci.* 65: 507-17.

Trevors, J.T. and Beauchamp, E.G., 1985. "Reduction of nitrous oxide (N^2O) by a bacterial isolate in the presence of sulfide and acetylene." *J. Microbiol. Meths.* 4: 127-31.

Trevors, J.T., 1985. "The influence of oxygen concentrations on denitrification in soil." *Appl. Microbiol. Biotechnol.* 23: 152-55.

Yanuka, M. and Elrick, D.E., 1985. "Applications of computerized digitization to soil and crop sciences." *Computers and Electronics in Agric.* 1: 59-73.

PROCEEDINGS

Reynolds, W.D. and Elrick, D.E., 1985. "Measurement of field-saturated hydraulic conductivity, sorptivity and the conductivity-pressure head relationship using the 'Guelph Permeameter'." *Proc. Ntl. Water Well Assn. Conf. on Characterization and Monitoring of the Vadose (Unsaturated) Zone.* Denver, Colorado, Nov. (no page numbers available).

BOOKS THESES, REPORTS

Angers, D.A., Kay, B.D. and Groenevelt, P.H., 1985. *Influence of previous cropping sequence of compression characteristics of an aggregated soil.* 10th Conf. of the Intl. Soil Tillage Res. Organization. Guelph.

Angers, D.A., Simard, R.R., Kay, B.D. and Groenevelt, P.H., 1985. *Soil compaction and organic matter content.* Ann. Conf. Agric. Inst. of Canada. Charlottetown, P.E.I.

Bates, T.E., Lane, T.H. and Johnston, R.W., 1985. *Soil acidity and liming.* Revised Factsheet Agdex 534, Order No. 85-105.

Bates, T.E., Lang, H.C. and Bourque, J.L., 1985. *How and where to use sewage sludge in crop production.* Factsheet Agdex 100/541, Order No. 85-093.

Brunsting, S.H. and Groenevelt, P.H., 1985. *A soil loss tolerance equation based on subsoil characteristics.* Ann. Mtg. Am. Soc. Agron. Chicago, Ill, Dec. (Presented by P.H. Groenevelt.)

Carlisle, S.M., 1985. *Effect of tthe herbicide glyphosate on selected soil microbial activities and on nitrogen fixation by Azotobacter vinelandii,* M.Sc. Thesis. Dept. of Environ. Bio., Univ. of Guelph.

Cobbina, J., 1985. *Phosphorus nutrition of Zea mays L. hybrid seedlings in relation to purpling.* Ph.D. Thesis. Univ. of Guelph, Mar.

Davenport, J.R. and Thomas, R.L., 1985. *The deposition and decomposition of below ground carbon in two cropping systems.* Can. Soil Sci. Soc. June.

El-Asswad, R.M. and Groenevelt, P.H., 1985. *Moisture conservation in a sandy soil due to modification of the hydrophysical properties of the soil surface and its influence on the yield of corn and potatoes.* Ann. Conf. Agric. Inst. Can. Charlottetown, P.E.I.

El-Asswad, R.M., Groenevelt, P.H. and Nickling, W.G., 1985. *The effects of PVA on the threshold shear velocity and soil loss due to wind.* Ann. Mtg. Am. Soc. Agron. Chicago, Ill., U.S.A., Dec. (Presented by P.H. Groenevelt).

Kay, B.D., Groenevelt, P.H., Angers, D. and Rachar, D., 1985. *The development of evaluation of methods to characterize soil structure.* 10th Conf. Intl. Soil tillage Res. Organization. Guelph.

Marsh, M.H. and Groenevelt, P.H., 1985. *The effect of soil surface treatment on runoff and phosphorus losses.* Ann. Conf. Agric. Inst. Can. Charlottetown, P.E.I.

Marsh, M.H. and Groenevelt, P.H., 1985. *The effect of soil surface treatment on sediment and phosphorus losses.* Ann. Mtg. Am. Soc. Agron. Chicago, Ill., Dec. (Presented by M.H. Marsh).

Marsh, M.H. and Groenevelt, P.H., 1985. *The effect of tillage and surface treatment on soil and nutrient losses by runoff.* 10th Conf. Intl. Soil Tillage Res. Organization. Guelph.

Miller, M.H., 1985. *Soil degradation in Eastern Canada. Its extent and impact.* Joint Mtg. Can. Soc. Soil Sci., Can. Soc. Agric. Ec., Can. Soc. Agron. and Can. Soc. Agric. Engng. Charlottetown, P.E.I. June.

FOOD

PERIODICALS

deMan, J.M., Gutpa, S., Klock, M. and Timbers, G.E., 1985. "Viscoelastic properties of plastic fat products." *J. Am. Oil Chemists' Soc.* 62: 1672.

deMan, J.M., Mostafa, A.N. and Smith, A.K., 1985. "Thermal analysis microscopy for the study of phase changes in fats." *Food Microstructure* 4: 233.

deMan, L., deMan, J.M., Ackman, R.G. and Ratnayake, W.M.N., 1985. "Trisaturates in the hydrogeneration of Canola oil with commercial nickel catalyst." *J. Am. Oil Chemists' Soc.* 62: 703.

Abraham, V. and deMan, J.M., 1985. "Determination of volatile sulfur components in Canola oil." *J. Am. Oil Chemists' Soc.* 62: 1025.

Akhtar, M. and Subden, R.E., 1985. "Production of volatile yeast metabolites in fermentating grape musts." *Can. Inst. Food Sci. Technol. J.* 18(4): 280-83.

Bettger, W.J., 1985. "Effect of dietary protein or amino acids on the rapid change in plasma zinc concentration in rats fed zinc deficient diets." *Nutr. Res.* 5: 1153-59.

Calderon, C., Collins-Thompson, D.L. and Usborne, W.R., 1985. "Shelf life studies of vacuum-packaged bacon treated with nisin." *J. Food Prot.* 48: 330-33.

Chu, C.L., Lougheed, E.C., Miller, P.L. and Wood, L.D., 1985. "Effect of low ethylene controlled atmospheres on five apple cultivars." *Abstr. in Rpt. of Comm. on Hort. Res. 1984.* Can. Hort. Council. p. 107.

Collins-Thompson, D.L., Calderon, C. and Usborne, W.R., 1985. "Nisin sensitivity of lactic acid bacteria isolated from cured meats." *J. Food Prot.* 48: 668-70.

Dodds, K. and Collins-Thompson, D.L., 1985. "Characteristics of nitrite reductase activity in Lactobacillus lactis TS4." *Can. J. Microbiol.* 31: 558-62.

Dodds, K. and Collins-Thompson, D.L., 1985. "Production of N^2O and CO^2 during reduction of NO^2 by Lactobacillus lactis TS4." *Appl. and Environ. Microbiol.:* 1550-52.

Gupta, S. and deMan, J.M., 1985. "Modification of rheological properties of butter." *Milchwissenschaft* 40: 321.

Kamel, B.S., Dawson, H. and Kakuda, Y., 1985. "Characteristic and composition of melon and grape seed oils and cakes." *J. Am. Oil Chemists' Soc.* 62: 881-83.

Lougheed, E.C., Valk, M., Knibbe, E. and Rey, F., 1985. "Controlled atmosphere storage of celery to control black stem." *Abstr. in Rpt. of Comm. on Hort. Res. 1984.* Can. Hort. Council. p. 153.

Lougheed, E.C. and Feryn, S., 1985. "Controlled atmosphere storage of cabbage, brussels sprouts and broccoli." p. 142. *Abstr. in Rpt. of Comm. on Hort. Res.* Can. Hort. Council.

Lougheed, E.C., Feryn, S., Valk, M. and Knibbe, E., 1985. "Controlled storage of celery." p. 141. *Abstr. in Rpt. of Comm. on Hort. Res.* Can. Hort. Council.

Lougheed, E.C. and Miller, S.R., 1985. "Low-oxygen storage of McIntosh apples." *Abstr. in Rpt. of Comm. on Hort. Res.* Can. Hort. Council. p. 146.

Lougheed, E.C. and Miller, S.R., 1985. "Storage of Daminozide (Alar) treated McIntosh apples." p. 146 *Abstr. in Rpt. of Comm. on Hort. Res.* Can. Hort. Council.

Lougheed, E.C., Proctor, J.T.A. and Wiley, L., 1985. "Low-oxygen storage of Spartan, Empire, Delicious, Golden Delicious and Idared apples." *Abstr. in Rept. of Comm. on Hort. Res.* Can. Hort. Council. p. 146.

Lougheed, E.C., Wiley, L.S. and Proctor, J.T.A., 1985. "Maturity indices for apples at the Cambridge Research Station." p. 146. *Abstr. in Rpt. of Comm. on Hort. Res.* Can. Hort. Council.

Manji, B., Hill, A., Kakuda, Y. and Irvine, D.M., 1985. "Rapid separation of milk whey proteins by anion exchange chromatography." *J. Dairy Sci.* 68: 3176-79.

Mittal, G.S. and Usborne, W.R., 1985. "Meat emulsion extenders." *Food Technol.* 39: 121-30.

Mittal, G.S. and Usborne, W.R., 1985. "Moisture isotherms for meat emulsions of different compositions." *J. Food Sci.* 50(6): 1576-79.

Mostafa, A.N. and deMan, J.M., 1985. "Application of infrared spectroscopy in the study of polymorphism of hydrogenated Canola oil." *J. Am. Oil Chemists' Soc.* 62: 1481.

Mostafa, A.N. and deMan, J.M., 1985. "Polymorphism of hydrogenated Canola oil." *J. Am. Oil Chemists' Soc.* 62: 756.

Mostafa, A.N., Smith, A.K. and deMan, J.M., 1985. "Crystal structure of hydrogenated Canola oil." *J. Am. Oil Chemists' Soc.* 62: 760.

Sarwar, G., Blair, R., Friedman, M., Gumbmann, M.R., Hackler, L.R., Pellett, P.L. and Smith, T.K., 1985. "Comparison between interlaboratory variation in amino acid analysis and rat growth assays for evaluating protein quality." *J. Assn. Off. Anal. Chem.* 68: 52-56.

Swatland, H.J., 1985. "A computer operated instrument for studying the development of rigor mortis in excised samples of pork and beef." *Can. Inst. Food Sci. Technol. J.* 18: 207-12.

Swatland, H.J., 1985. "Development of rigor mortis in intact side of pork measured with a portable Rigorometer." *J. Anim. Sci.* 61: 882-88.

Swatland, H.J., 1985. "Fibre-optic spectrophotometry of anomalous bovine skeletal muscles and the cellular distribution of myoglobin and succinate dehydrogenase." *Histochem. J.* 17: 675-82.

Swatland, H.J., 1985. "Measurement of veal color by fibre optic spectrophotometry." *J. Food Sci.* 50: 1689-90.

Swatland, H.J., 1985. "Optical and electronic methods of measuring pH and other predictors of meat quality in pork carcasses." *J. Anim. Sci.* 61: 887-91.

Swatland, H.J., 1985. "Patterns of succinate dehydrogenase activity in a leg muscle of the domestic duck during postnatal development." *Can. J. Zoo.* 63: 55-57.

Swatland, H.J. and Belfry, S., 1985. "Post mortem changes in the shape and size of myofibrils from skeletal muscle of pigs." *Histochemistry* 82: 29-34.

Walsh, J.E., Lougheed, E.C. and Bishop, D.J., 1985. "Electronic monitoring and control of carbon dioxide and oxygen in controlled atmospheres (CA)." *Proc. Int. Soc. Hort. Sci. Working Group, Storage of Vegetables.* Univ. of Montreal, Montreal, Quebec, June. *Acta. Hort.* 157: 51-56.

PROCEEDINGS

Alexander, J.C., Gabriel, H.G. and Lougheed, E.C., 1985. "Effects of controlled atmosphere storage on the nutrient contents of celery." *Can. Inst. Food Sci. Technol. J.* 18: XXXV. *Abstr. for 20th Ann. Conf.* Toronto.

Alexander, J.C. and Yoshida, H., 1985. "Enzymatic hydrolysis of thermally oxidized canola oil." *J. Am. Oil Chem. Soc.* 62(4): 696. *Abstr.* 78.

Lidster, P.D., Blumpied, G.D. and Lougheed, E.C., 1985. "Factors affecting low-O^2 injury in apples." *Proc. 4th Int. CA Conf.* North Carolina State Univ., Raleigh, N.C., *July.* pp. 57-69.

Lougheed, E.C., Bishop, D.J. and Blumpied, G.D., 1985. "Sources of variation and variability in measuring and adjusting controlled atmospheres." *Proc. 4th Int. CA Conf.* North Carolina State Univ., Raleigh, N.C., July. pp. 213-28.

Lougheed, E.C., Wiley, L.S. and Proctor, J.T.A., 1985. "Small scale simulated commercial CA storage rooms." *Proc. 4th Int. CA Conf.* North Carolina State Univ., Raleigh, N.C., *July.* pp. 235-47.

Meiering, A.G., 1985. "Microcomputer systems for monitoring and controlling wine fermentations." *Abstr. in Rpt. of Ont. Grape and Wine Res. Comm.*

BOOKS, THESES, REPORTS

Alexander, J.C. and Yoshida, H., 1985. "Triacylglycerols from thermally oxidized oils." *Proc. Can. Div. Am. Oil Chem. Soc.* 8th; Ottawa, Oct.

Cunningham, J.D., 1985. A.O.A.C. collaborative studies on the use of the Bactoscan in the rapid determination of total numbers in milk. Spring *A.O.A.C. Referee's Rpt.* Washington, D.C., U.S.A.

Rasper, V.F., Hardy, K.M. and Fulcher, G.R., 1985. "Constant water content vs. constant consistency techniques in alveography of soft wheat flours." *Rheology of Wheat Products.* Ed. H. Faridi. Am. Assn. Cereal Chemists. St. Paul, MN. pp. 51-74.

Wang, C.K. and Mittal, G.S., 1985. *Changes in thermal properties of meat emulsion during cooking.* Can. Agric. Engng. Poster Session. Guelph.

AGRICULTURAL ECONOMICS

PERIODICALS

Blackburn, D.J., 1985. "77 percent say 'yes' to OMAF News." *OMAF News.* June. pp. 1, 4.

Farrell, C. and Funk, T.F., 1985. "The determination of ex-ante returns to agricultural research: The case of plant biotechnology in Canada." *Can. J. Agric. Ec.* 33: Mar.

BOOKS, THESES, REPORTS

Blackburn, D.J., 1985. *Farm information transfer and reception. A slide-cassette script.* Western Farm Mgmt. Ext. Comm. Mtgs. Saskatoon, Sask., Oct. 16 pp.

Blackburn, D.J., 1985. *Readership survey of OMAF News and other media.* Res. Rpt. AEEE/85/1. Sch. Agric. Ec. and Ext. Ed., Univ. of Guelph, April. 18 pp.

Brinkman, G.L., 1985. *An overview of Canadian agriculture in the 1980's.* Farm Leadership Conf. Guelph. 45 pp.

Brinkman, G.L., 1985. *The agricultural finance problem in prespective.* Can. Bankers' Assn. Agric. Credit Conf. Nov. 58 pp.

Brinkman, G.L. and Brown-Andison, N., 1985. *Farming in Canada and Ontario in the 1980's, changes in the nature of farms, capital in farming and farm family financial returns.* Sch. Agric. Ec. and Ext. Rpt. 64 pp.

Clark, J.H. and Sarpong, O., 1985. *The Financial Problem of Ontario Agriculture During the 1980's.* Ext. Bull. Sch. Agric. Ec. and Ext. Ed., Univ. of Guelph.

de Gorter, H. and Meilke, K.D., 1985. *The political-economic determination of wheat producer support prices in the European Economic Community.* Agric. Ec. Assn. Ann. Mtg. Aug. 19 pp.

Driver, H.C. and Glance, S., 1985. *Developing crop and livestock budgets from ODFAP records.* Res. Rpt., Production Cost Analysis Sect., Inputs and Technology Analysis Div., Regional Economic Development Branch, Agric. Can., AEB, Univ. of Guelph. June.

Driver, H.C. and Otwoma, S.O., 1985. *Profiles in management and performance for assessment of information needs.* CAEFMS, ARC Ann. Mtg. Charlottetown, P.E.I. June (Contributed paper).

Funk, T.F. and Meilke, K.D., 1985. *Price determination.* OMAF publication AGDEX 840. 4 pp.

Martin, L., 1985. *Statement to the U.S. Intl. Trade Commission.* Washington, D.C., July.

Martin, L.J. and Goddard, E.W., 1985. *Statement to the U.S. International Trade Administration.* U.S. Dept. of Commerce. Washington, D.C., Feb.

Martin, L.J. and Meilke, K.D., 1985. *Trade implications of Canadian stabilization programs: reality and perception.* Agric. Can. Workshop on Modelling Beef Stabilization Policy. Ottawa, June. 42 pp.

McIlveen, F. and Brinkman, G.L., 1985. "The role of education and research." *Farming and the Rural Community in Ontario: An Introduction.* Ed. A.M. Fuller. Toronto: Univ. of Toronto Press.

McGee, K.D. and de Gorter, H., 1985. *An econometric model of the European Community's wheat sector.* Discussion paper 85/1. Univ. of Guelph, June. 66 pp.

Miller, S., 1985. *Demand for eggs in Canada.* M.Sc. Thesis. Univ. of Guelph. May.

Morse, B., 1985. *Seasonal agricultural employment in the flue-cured tobacco farming industry of southern Ontario.* M.A. Thesis. Univ. of Guelph.

Tabi, J. and Stonehouse, D.P., 1985. *Statistical analysis of the characteristics of Ontario quota exchange participants.* Ont. Milk Mktg. Board, Ann. Rev. Seminar. Univ. of Guelph, May.

Tarvey, C.C., 1985. *Evaluating the contributions of economic risk to E-V efficient portfolio selection in agriculture.* M.Sc. Thesis. Univ. of Guelph. June.

PROCEEDINGS

Brinkman, G.L., 1985. "Farm survivability in the 1980's." *Proc. East. Ont. Farmers' Mtg.* RCAT, Kemptville, Feb. pp. 10-23.

BIOMEDICAL SCIENCES

PERIODICALS

Alexander, D.I., and Eyre, P., 1985. "P 1 purinoceptors mediate relaxation of bovine bronchial artery." *Europ. J. Pharmac.* 107: 359-362.

Atwal, O.S. and Saldanha, K.A., 1985. "Erythrophagocytosis in Alveolar Capillaries of Goat Lung: Ultrastructural Properties of Blood Monocytes." *Acta Anat.* 124: 245-254.

Carter, R.R., Growum, W.L. and Bignell, W.W., 1985. "Effect of toxicity in contents of the stomach and duodenum and in blood on parotid salivary secretion in sheep." *Proc. Nutr. Soc.* 44: 137A.

Growum, W.L. and Leek, B.F., 1985. "The sensory receptors of the sheep's forestomach responsible for reflex elicitation of parotid salivary secretion." *J. Physiol.* (London) 364: 35 pp.

Harris, W.H., Foster, D.O. and Nadeau, B.E., 1985. "The relationship between the thermogenic response of brown adipose tissue and age during noradrenaline infusion in the young rabbit." *Can. J. Physiol. Pharmacol.* 63: 1215-1220.

Harris, W.H., Foster, D.O. and Nadeau, B.E., 1985. "Evidence for a contribution by brown adipose tissue to the development of fever in young rabbits." *Can. J. Physiol. Pharmacol.* 63: 595-598.

Peter, A.T. and Laprap, R.M., 1985. "Plasma gonadotrophin levels in sows with experimental cystic ovarian follicles." *Br. Vet. J.* 141: 288-296.

Peter, A.T., Huether, P., Doble, E. and Laprap, R.M., 1985. "Prostaglandin F2a and prolactin in experimental hypoglactia in sows." *Res. Vet. Sci.* 39: 222-229.

Raeside, J.I. and Renaud, R.L., 1985. "Identification of 3B-hydroxy-5,7-androstadien-17-one as a secretory product of the fetal horse gonad in vivo and in vitro." *J. Endocrinology* 107: 415-419.

Raeside, J., Friendship, R.M. and Ryan, P.L., 1985. "Impaired estrogen production in Leydig cells of the naturally retained testes in unilaterally cryptorchid boars and stallions." *Proc. Can. Fed. Biol. Soc.* 28: 188.

Raeside, J., Renaud, R.L. and Ryan, P.L., 1985. "Reduced aromatization of c3 H)-androstenedione in Leydig cells of naturally retained testes in unilaterally cryptorchid boars." *Biol. Reprod.* 32, Suppl. 1: 119.

Robinson, G.A., 1985. "Dispersal of estradiol-17B from the site of injection in the pectoral muscles of Japanese quail." *Poultry Sci.* 64: 1793-1997.

Wilson, D.J. and Gentry, P.A., 1985. "T-2 toxin can cause vasoconstriction in an in vitro bovine ear perfusion system." *Toxicol. Appl. Pharm.* 79: 159-165.

PROCEEDINGS

Bhatnagar, M.K., Snelgrove, S.M. and Singh, A., 1985. "Intracisternal microtubules in the proximal tubule cells of ducks kidney: what is their significance." *XIII Intl. Anatomical Congress*, London, England, August 11-17.

Robinson, G.A. and Gibbins, A.M.V., 1985. "Increased clearance rate of plasma thyroxine accompanies estradiol-induced vitellogenesis in male Japanese quail." *Poultry Sci.* December 1985 issue.

BOOKS, THESES, REPORTS

Growum, W.L., 1985. "Control of motility of the reticulorumen." *Control of Digestion and Metabolism in Ruminants.* Eds. Milligan, L.P., Growum, W.L. and Dobson, A., New Jersey: Prentice Hall pp. 18-40.

Growum, W.L., 1985. "Appetite, palatability and control of feed intake." *The Ruminant Animal Part II. Nutrient Consumption, Metabolism and requirements.* Ed. D.C. Church Corvallis, Oregon: O & B Books Inc.

Milligan, L.P., Growum, W.L. and Dodson, A., 1985. *Control of Digestion and Metabolism in Ruminants.* Prentice Hall, New Jersey. 680 pp.

PATHOLOGY

PERIODICALS

Julian, R.J. and Bhatnagar, M.K., 1985. "Cartilage lesions associated with Shaky-leg Locomotor in turkeys." *Avian Diseases.* 29:1.

Percy, D.H., Prescott, J.F. and Bhasin, J.L., 1985. "Pasteurella multocida infection in the domestic rabbit: Immunization with a streptomycin-dependent mutant." *Can. J. Comp. Med.* 49: 227-230.

VETERINARY MICROBIOLOGY AND IMMUNOLOGY

PERIODICALS

Filion, L.G., Cho, H.J., Shewen, P.E., Raybould, T.J. and Wilkie, B.N., 1985. "Comparison of serological techniques to measure antibody to Pasteurella haemolytica A1." *Can. J. Comp. Med.* 49: 99-103.

Lo, R.Y., Shewen, P.E., Strathdee, C.A. and Greer, C.N., 1985. "Cloning and expression of the leukotoxin gene of Pasteurella haemolytica A1 in Escherichia Coli K-12." *Infect. and Immun.* 50: 667-671.

Reed, C.R., and Barnum, D.A., 1985. "Effect of treatments of caecal contents on their protective properties against salmonella in poults." *Avian Dis.* 29.

Shewen, P.E. and Wilkie, B.N., 1985. "Evidence for the Pasteurella haemolytica cytotoxin as a product of actively growing bacteria." *Am. J. Vet. Res.* 46:1212-1214.

Shewen, P.E. and Wilkie, B.N., 1985. "Prevention of bovine pneumonic pasteurellosis." *Highlights agric. res. Ont.* 8(3): 4-6.

BOOKS, THESES, REPORTS

Gyles, C.L., 1985. "Immunization to protect against enteric infections in young pigs." *Swine Res. Update.* OMAF. Centralia.

Lynch, J.A., 1985. *A modified indirect fluorescent antibody test for detection of antibodies to bovine respiratory syncytial virus.* D.V.Sc. Thesis, Univ. of Guelph, April.

CLINICAL STUDIES

PERIODICALS

Breboc, M., 1985. "Living without chloramphenicol." *Canadian Vet. Supplies.* Winter 1985.

Davidson, K., 1985. "The return of penicillin." *Cattleman - The Beef Magazine.* September.

PROCEEDINGS

Bateman, K.G., 1985. "Is there life after chloramphenicol?" *Breeder and Feeder.* September.

Miniats, O.P. and Rosendal, S., 1985. "Haemophilus pleuropneumoniae infections in non-immunized and immunized conventional and gnotobiotic pigs." *Abs. of 23rd Mtg. Assoc. for Gnotobiotics.* Guelph 1985.

BOOKS, THESES, REPORTS

Bateman, K.G., 1985. "Antibiotic therapy for bovine respiratory disease." *VLS Extension Notes.* Sept. 1985. 3 pp.

Miniats, O.P. and Rosendal, S., 1985. "Response of gnotobiotic pigs to immunization and challenge with Haemophilus pleuropneuminiae." *Germ-free research: Microflora control and its applications in the biomedical sciences.* B. S. Wastmann Ed. Allan R Riss Inc., N.Y. pp. 411-414.

HORSES

PERIODICALS

Zink, M., Yager, J.A., Prescott, J. and Wilkie, B.N., 1985. "In vitro phagocytosis and killing of Corynebacterium equi by foal alveolar macrophages during postnatal maturation." *Amer. J. Vet. Res.* 46: 2171-2174.

FISH

PERIODICALS

Daoust, P.Y. and Ferguson, H.W., 1985. "Nodular gill disease - a unique form of proliferative gill disease in rainbow trout (Salmo gairdneri R.)." *J. Fish Dis.* 8: 511-522.

Dixon, D.G. and Hilton, J.W., 1985. "Effects of available dietary carbohydrate and water temperature on the chronic toxicity of waterborn copper to rainbow trout." *Can. J. Fish. Aquat. Sci.* 42: 1007-1013.

Ferguson, H.W., Lom, J. and Smith, I., 1985. "Intra-axonal protozoa in the common shiner - ultrastructural features." *Vet. Path.* 22: 194-196.

Ferguson, H.W., Rosendal, S. and Groom, S., 1985. "Neocrotic gastritis in a Lake Tanganyika cichlid dubaisi." *Vet. Rec.* 116: 687-689.

Lanno, R.P., Slinger, S.L. and Hilton, J.W., 1985. "The effect of escorbic acid on dietary copper toxicity in rainbow trout." *Aquaculture* 49: 269-287.

Lanno, R.P., Slinger, S.J. and Hilton, J.W., 1985. "Maximum tolerable and toxicity levels of dietary copper in rainbow trout (Salmo gairdneri)." *Aquaculture* 49: 257-268.

PROCEEDINGS

Hayes, M.A., Heeney, J., Smith, I.W., Hicks, B.C. and Ferguson, H., 1985. "The significance of neoplasia in wild fish populations." *Proc. Technology Transfer Conf.* Part 2. *Water Quality Res.* pp. 357-369.

Hilton, J.W., Atkinson, J.L. and Slinger, S.J., 1985. "Effect of prolonged bovine insulin injections on glucose utilization in rainbow trout." *28th Ann. Mtg. Can. Fed. of Biol. Soc.* Toronto. June 17-21. Abs. No. PA 197.